March 1974

Smithsonian

Chinese practice traditional exercise on Bund as old Shanghai reveals its new face (p. 26)

Steelworker Arthur Hassler and daughter Barbara finish college together

Arthur Hassler has worked for Bethlehem for 32 years and is now supervisor of scheduling at one of our high-production rolling mills. Over the past six years, he also has pursued a delayed college education, going to classes four nights a week and summer sessions, too.

Last June, at age 52, Arthur was graduated *cum laude* from Moravian College with a BA degree in economics and business administration. His daughter Barbara received her liberal arts degree at the same ceremony. It was the first time in the college's 167-year history that a father and daughter were graduated in the same year.

Arthur has some encouraging things to say about today's college students, "I used to see a youth with long hair and right away I'd think 'He's a hippie.' But being with these kids in the classroom, I soon found out otherwise. Students are much more concerned and aware nowadays. For the most part, they're optimistic about life. They're going to school for a purpose."

Arthur earned his degree by taking advantage of Bethlehem's educational assistance program. The program encourages our full-time, salaried employees to continue their education by providing full reimbursement for tuition costs of approved courses of study which they successfully complete.

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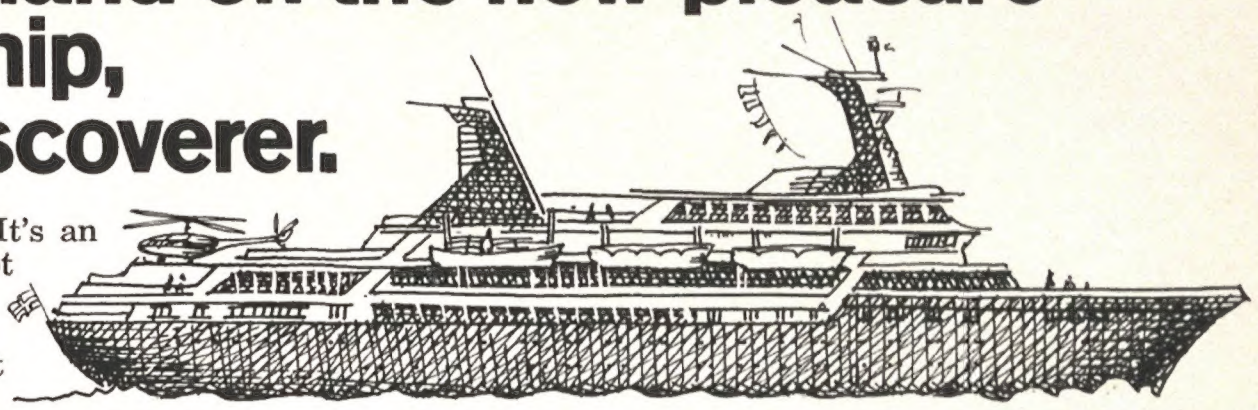

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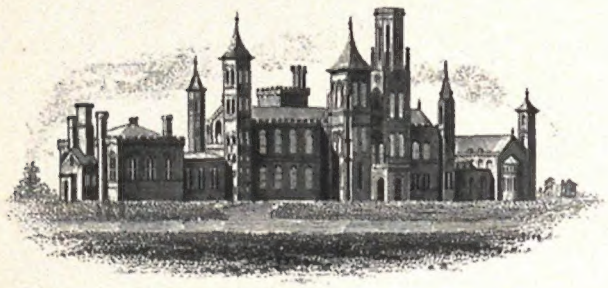
Secretary Ripley's comments

The view from the castle



Jolted by the energy crisis, we should rediscover some truths about our interdependence—and our humanity

Two years ago the Smithsonian, along with the Woodrow Wilson International Center for Scholars, helped sponsor a symposium to discuss the *Limits to Growth* study, which was produced by systems analysts at MIT under the sponsorship of the Club of Rome, an international studies group. As an ecologist, I was much interested in the charts showing the interdependence of future population trends and the use of natural resources, agriculture, industrial growth and pollution in years to come. I also noted some reasoned scoffing at the report by economists and by science writers, pointing out all the possibilities of error in such crystal-ball thinking. When the report appeared in book form shortly thereafter, many of the reviewers echoed these sentiments.

Now, two years later, we have a fuel shortage, and Americans, representing six percent of the world's population but conditioned to gobbling up some 40 percent of the world's resources, are beginning to get the message. For more than 50 years most Americans have not felt that all the international bureaus and offices constantly talking about one-world politics, economics and world interdependence really had very much to do with them.

Our Congress, faithfully mirroring the wishes of its constituents, has tended as a result to lose interest in many of the international organizations which imply such one-world interdependence. Aside from our military authorities, who think constantly about how to defend us, we as a people seem to believe that international affairs are a sort of business contest, that "the mostest belongs to the fustest," and that that's what the State Department is supposed to help our corporations achieve. In sum, it all appeared to have very little to do with our day-to-day living—up until now, that is.

Elsewhere I have talked about truth being a revolutionary concept. It is also a most mysterious and elusive quantity. We like to grab at it, packaged, in small doses—"truth in advertising," "truth in science and medicine" like wonder drugs, "truth in the mysteries of nature" (which are always mysteries, by the way). But as humans we are fated never to know truth, that is to say, truth beyond the most elementary evidence. Truth is merely what one makes of it subjectively.

Under the present circumstances we are being jolted into thinking about some of those issues which *Limits to Growth* was charting. The *interdependence* of everything today has come home to us. The fate of all the nations, developed or underdeveloped, has come to be inexorably intertwined with our own everyday needs. We cannot just think about those people over there, the way we used to, putting an offering for foreign missions into the plate at church. We used to think that only priests or scientists or, more recently, economists—people who had elected to do such things—had to bother thinking complex international thoughts. Now we all have to think them, and be a little skeptical, too, about what we are told.

This side effect of the energy crisis seems most encouraging and perhaps makes it worth the inconvenience. We have it within us to open the plastic wrapping and, for a moment in time, to handle the truth and in the process to rediscover our humanity.

S. Dillon Ripley

The Mexican Collection

(top left) **Acrobat of Tlatilco.**
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(top right) **Atlante from Tula.**
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(lower left) **Tehuana Lady** in Fiesta Costume. Contemporary/Folkloric/ 8⅝" high including base. Numbered Issue of 300, $1750.

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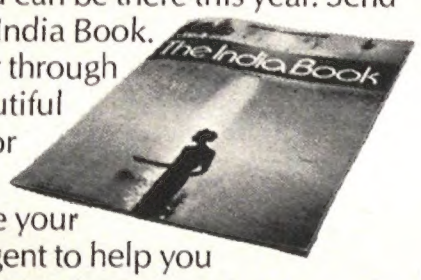

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Phenomena, comment and notes

Nuclear power and possum power, the use of snoozing, fallout from a drought, and Mbang goes home

Mbang is back and the kingdom of Kom is calm. This is not a fairy tale; it is welcome news not only in Kom but in the international art world.

Mbang is the familiar name of a wooden statue known formally as Afo-A-Kom and it is the repository of political and religious legitimacy in the small Cameroonian kingdom. About seven years ago the statue disappeared mysteriously and the king—the Fon of Kom—ruled uneasily in his nervous land.

Last year the *New York Times* was alerted that the statue was in the collection of a New York art dealer and the result of the ensuing furor was that Mbang was delivered to the Fon last December in the care of Warren Robbins of the Museum of African Art in Washington, D.C. A relieved Fon received the statue at the Sheraton Mont Febe Palace in Yaoundé, Cameroon's capital city (see photograph), and amid historic celebrations returned with it to Kom, the wellspring of his leadership once again intact.

The event was indeed worth celebrating since it is one of the few happy endings in the growing illicit trade of art objects. And if the story seems a bit quaint, just think how Americans would feel if someone ran off with the U.S. Constitution.

Watch the itty-bitty fingers

Given the amount of baby talk that adults talk to babies, it's surprising that babies learn to talk at all. Just how surprising is now even more apparent, thanks to two researchers at the Child Development Unit at the Boston University Medical Center, William S. Condon and Louis W. Sander.

The speech of adults is accompanied by tiny unconscious motions of the body as well as larger gestures. Newborn babies also make a variety of tiny movements and Drs. Condon and Sander filmed them. In a frame-by-frame analysis, they found

The Fon of Kom (right) welcomes home a prodigal Mbang.

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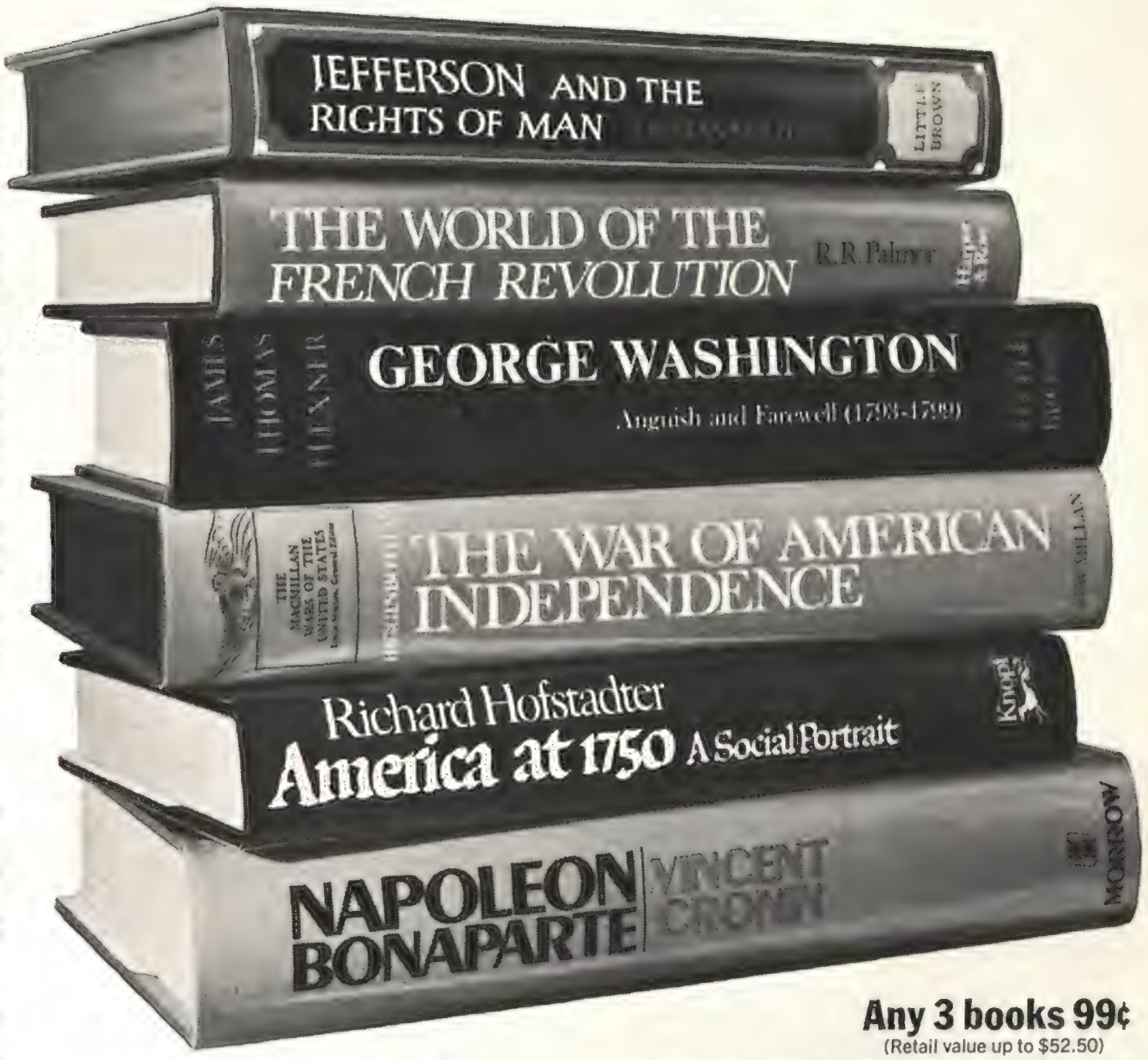

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that the babies' movements were not always random. When someone began to talk, a baby's movements quickly adjusted into nearly perfect synchrony with the rhythm of the voice. This occurred whether the words were English or Chinese, live or tape-recorded, but not if the speaker spoke disconnected vowel sounds or simply tapped. It would seem, then, that we are *active* participants in society from the very moment we are born.

Writing in *Science*, the two researchers suggest that this physical response to the natural rhythms of speech may be just what prepares an infant to speak a year or so later. The implications of this insight could keep a variety of scientists (and philosophers) busy for years, but, in the meantime, if you insist on saying such things as "goo-goo" to babies, at least say them with rhythm.

Whose drought?

"You've got your troubles," runs the lyric, "I've got mine." A good song, but not much of a philosophy, and meteorologically it's just plain wrong, as some observations by the National Oceanic and Atmospheric Administration show.

Last year there was a wave of concern about the drought and impending famine in the sub-Saharan zone of Africa (SMITHSONIAN, September 1973). But public concern on this side of the Atlantic soon shifted to such things as politics, food shortages, oil shortages and Christmas. Meanwhile the Sahara has continued to grow southward and many people have starved. And by way of a reminder, the Sahara's dust has floated upward to be blown across the Atlantic in vast clouds. Saharan dust has probably always graced the skies of the Caribbean, but now, since the beginning of the drought more than five years ago, it has grown so thick—concentrated at about 10,000 feet—that NOAA estimates it has blocked out about ten percent of the solar energy reaching the tropical Atlantic. It may not be all bad: The dust is heated up over Africa and forms an inversion layer over the sea, inhibiting the growth of cumulus clouds, which may have something to do with the recent decrease in hurricane activity.

Why sleep?

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you do for about one-third of your life) is not "dead-time." They find that in a physiological sense it does just about what Shakespeare said it does: "knits up the ravell'd sleave of care." But now, according to *New Scientist,* some British animal behaviorists have come along to suggest another—and, they feel, the original—function of sleep.

If sleep's chief job is to repair vital physiological processes, asks a London biologist, then why do the opossum and the armadillo—which sleep 19 hours a day—need so much more repair-work than certain porpoises and antelope, which don't sleep at all? Instead of the sleave-knitting theory, an Oxford biologist proposes what one might call the retreat-to-safe-ground theory. He developed "a mathematical model which expressed in elegant terms the commonsense conclusion that when environmental conditions are such that almost anything the animal does is liable to lead him into trouble he is best advised to do nothing at all." For example, inactivity is preferable to stumbling around in the dark, chasing the wrong things to eat and not seeing what is about to eat you.

Then what about all of the many nocturnal animals? It turns out that, like many Americans who have felt ill-used by being asked recently to rise before the sun comes up, not all nocturnal animals prowl the darkness willingly. According to *Science News,* experiments at the University of California at Los Angeles show that, given the chance to control the light level, such predators as foxes and weasels prefer a well-lit arena for hunting. The UCLA researchers opine that they are nocturnal only because, in nature, there is more prey around at night.

If that is the case, one may wonder why the fox's prey doesn't take the advice of the British animal behaviorists and run around by day. Then everyone would be able to get a good night's sleep.

Possums and power

Perhaps humans should take the advice of the British animal behaviorists and sleep more: It seems that every time we turn around we're in the soup again. (Humans, on the average, sleep about as much of the day as moles.) Maybe we should spend more time doing nothing.

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the building of nuclear power plants. Aside from safety considerations (which are yet to have a thorough public hearing), there is another problem. Before the turn of the year—and before the present drive to speed up nuclear power—the Organization for Economic Cooperation and Development and the International Atomic Energy Agency analyzed the the world's uranium needs between now and 1990. According to *Scientific American,* they foresaw a serious shortage of uranium by 1980 and said that by 1990 we will have to be discovering uranium reserves at nearly four times the present rate. To increase reserves means more exploration and the report suggests that the price of uranium might be raised to encourage that.

This reminder that you can't get something for nothing leads to the next question: Just how much can you get? One distressing answer comes from E. J. Hoffman, a chemical engineer who has made an analysis of energy input and output for nuclear power. For example, the largest consumers of electricity in the United States are the AEC's nuclear fuel processing plants in the TVA area, according to one study. Hoffman added up all of the input of energy in extracting uranium, refining it and transporting it. He concluded that the net yield of electrical power may run as low as 3 percent, not the usually projected 30 percent.

Certainly there are vigorous opponents of Hoffman's analysis and there will probably be assurances made about uranium supplies. Still, perhaps the human race should lay plans now to emulate the soporific opossum. At least it is a better model than the ostrich.

JAMES K. PAGE JR.

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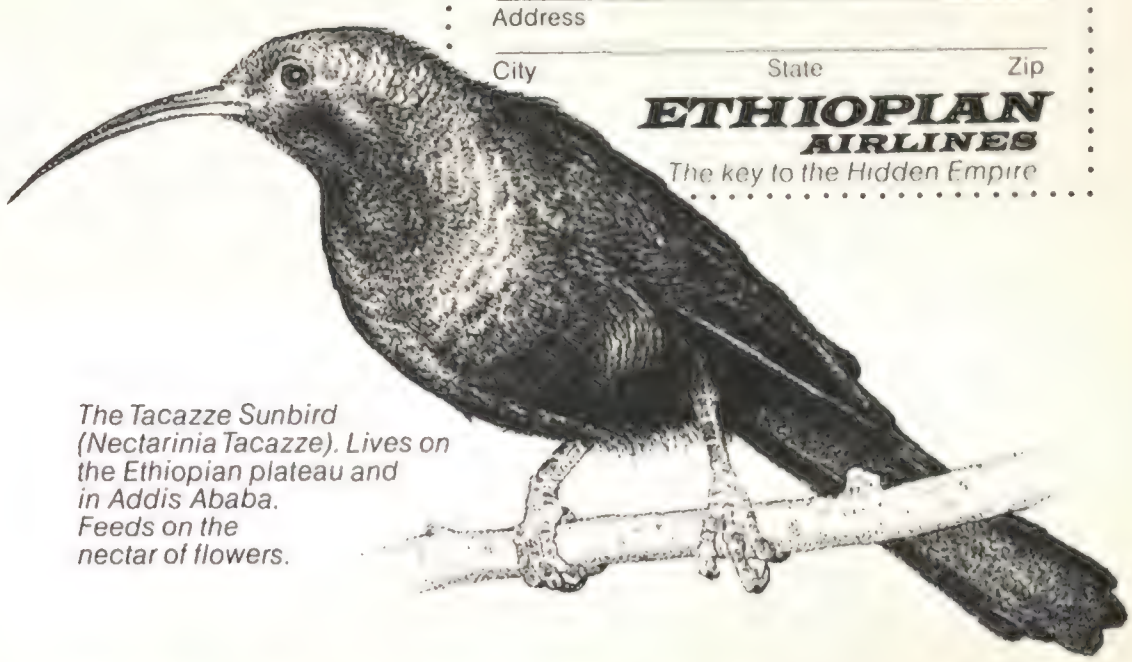

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Letters to the Editor

Bigfoot

Dear Sir: It might be construed by your readers from the opening paragraphs of your January article, "The search goes on for Bigfoot," that I subscribe to the theory that there are Bigfoot/Sasquatch in the Eastern states. I do not.

I have in my files a newspaper story from the *Memphis Enquirer,* dated May 9, 1861, which described a Bigfootlike creature that many people claimed to have seen in Greene and Poinsett counties in Arkansas. It is possible that there were a few of the creatures in Arkansas and other Eastern states in the 19th century, but with the vast reduction of the native forests of the East, it is hardly logical to believe that they remain hidden there today.

In the Pacific Northwest, where, if one includes the British Columbia coastal ranges, there are thousands of square miles of dense mountain forests, a small colony of the creatures is much more feasible. Indeed, my years of research have uncovered evidence that strongly supports the existence of such a colony.

Peter Byrne
The Dalles, Oregon

Dear Sir: I would like to point out that author Russ Kinne used one of my photographs showing a Sasquatch footprint without my permission and without giving credit to me. Also, part of the Kinne article was lifted from *Sasquatch,* which I co-authored with Don Hunter.

René Dahinden
Richmond, British Columbia, Canada

Mr. Dahinden is correct about the photograph. SMITHSONIAN *found out about the proper credit after the magazine was off the press. As to the Dahinden-Hunter book, neither Mr. Kinne nor* SMITHSONIAN *knew it existed; Mr. Kinne obtained his material from other sources, as detailed in the article.* Ed.

Dear Sir: The author struck a remarkably good comparison on the potential for Sasquatch to remain relatively well hidden in the wilderness of the Northwest when he wrote that a herd of elephants could be hidden in any square mile of that area with no trouble at all.

Precisely this kind of controversy was a mild diversion for myself and thousands of other American servicemen stationed in Vietnam in 1967. Peasants of the Mekong Delta region maintained that the dense forests still hid herds of wild elephants. Most Americans scoffed.

Finally, a helicopter crew took some photographs of a small herd, which reminds me that if these elephants could forage undetected despite the search and reconnaissance efforts of hundreds of thousands of men—then Sasquatch, if he exists at all, has an excellent chance of remaining free.

The last thing I heard about elephants in Vietnam was that a herd had been sighted, but they were dead—their sides and backs displaying the unmistakable stitching of machine-gun fire. Whether they were shot by Americans or by Vietnamese is inconsequential. Whenever something rare or beautiful threatens the secure monotony of the world of men, we either shoot it, merchandise it or build an eight-lane highway through it.

Run, Sasquatch, run!

Thomas L. Farley
Browns Mills, New Jersey

Hunting

Dear Sir: When considering Jack Hope's article on hunting, embellished by Ken Rinciari's revolting illustrations, it is good to keep in perspective that hunting as a human activity is as old as eating. Those of us who can recognize our real natures and accept ourselves as we have been made, also can accept the normalcy and naturalness of our enthusiasm for hunting.

The snapshot (see p. 18) of this writer was taken in the Great Piece Meadows in northern New Jersey at a happier time in 1958. The spot where it was taken is now

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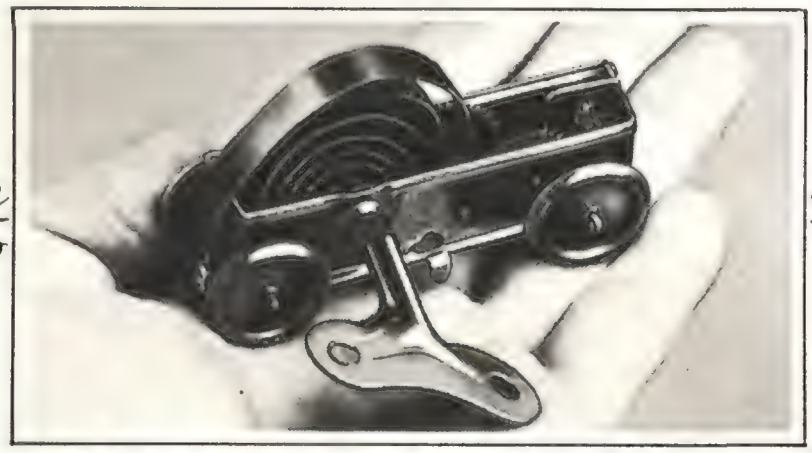

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George Wilson
Marquette, Michigan

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Dear Sir: In deeds and words, hunters were "friends of animals" long centuries before anyone else—especially those who are currently collecting tax-free contributions for the "crusade" to eliminate hunting and trapping from the fields, woods and streams of our country.
John R. Schneider
Apalachin, New York

Dear Sir: Perhaps it is not that a nonhunter cannot "fathom the hunter" or that he finds the hunter psychically abnormal, "seduced by a cruel passion for killing." Rather, nonhunters may feel it is of moral benefit to society that certain instincts be sublimated, just as, say, trial by combat should no longer be a civilized method of settling disputes, or slavery an acceptable relationship between men.
Stephen J. Romaine
Elsah, Illinois

Siberia

Dear Sir: Howard Sochurek's article on Siberia was excellent, and the photography rivaled the text. But I question the picture caption statement that the pony fur ski coverings are for the purpose of insulating against the cold. Actually, covering the underside of skis with fur is for traction. Since the nap of the fur points to the rear of the ski, it keeps the skier from slipping backward but does not hinder forward movement.
Richard F. Brown (Colonel, USA Ret.)
Carlisle, Pennsylvania
It is true that the pony fur provides traction, but author Sochurek's interpreter pointed out that in Siberia it is also used for insulation. Ed.

Fish schooling

Dear Sir: Aside from the protective reasons Susan Schlee gives for fish schooling, the definition of "protection" I subscribe to is that *many* of any prey species makes it all the more difficult for a predator to take just one. Whether you're a hunter shooting into a flock of birds or a tarpon charging a pod of mullet, your chance of success only increases in proportion to your ability to lock out awareness of all peripheral activity except the one creature you are pursuing.
George W. Reiger
Washington, D.C.

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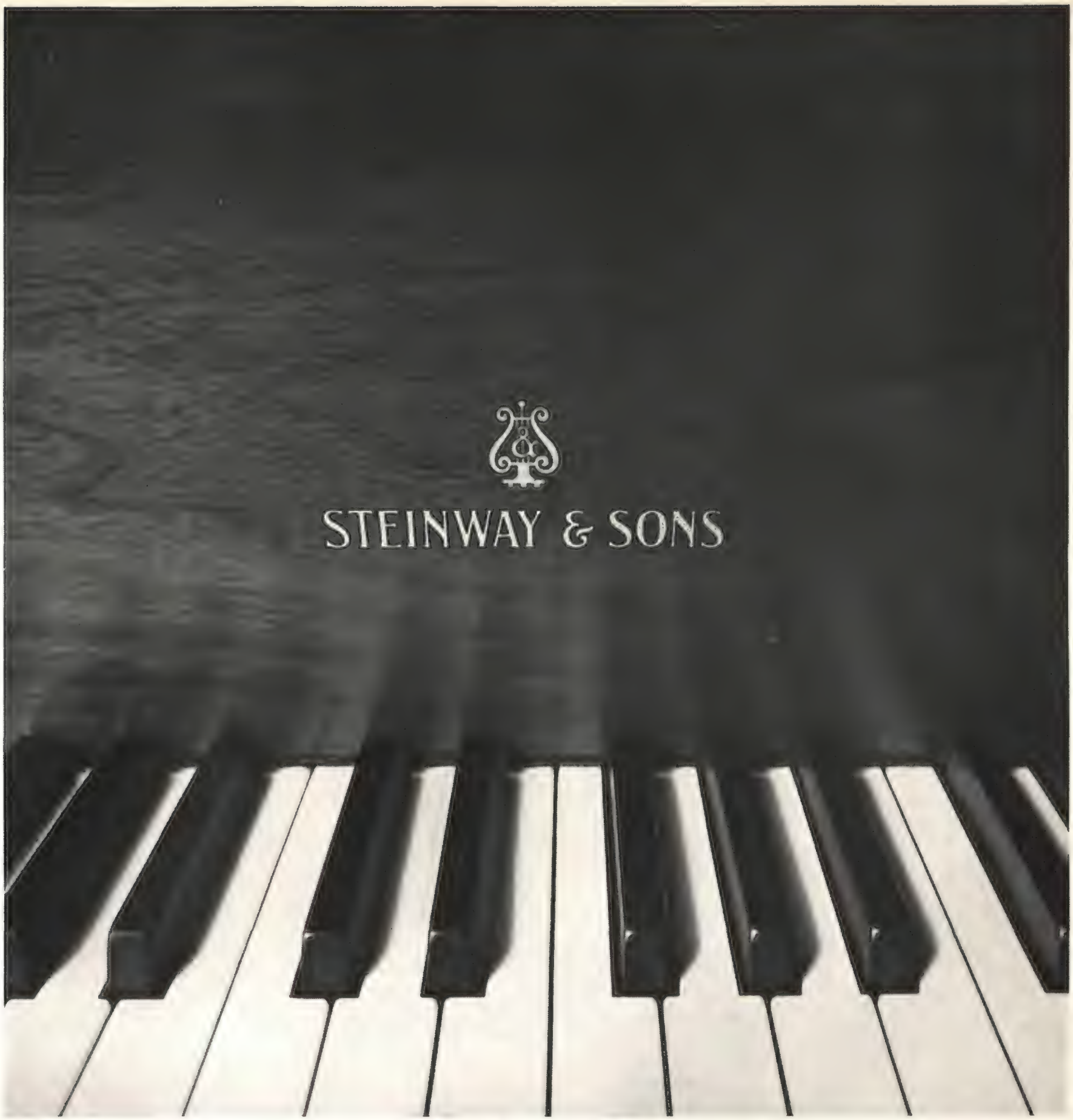
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200 years ago this month

Salvage work off Cape Cod; shots on the frontier

MARCH 1774

On the second of this month eight lamplighters touch off the wicks of 310 streetlamps, and all around them Boston's icebound winter night is suddenly dispelled. The citizens turn out to marvel. They have been looking forward to this civic luxury since they taxed themselves for it a year ago. Now they can forget for a moment the biting chill of the east wind, the frozen slush on the cobbled streets underfoot and the bleak knowledge that spring is still a long way off and sure to bring with it bad news from London. Now, around each lamppost, there is a yellow pool of light, magical and festive and somehow hopeful.

Those lamps were shipped in the brig *William* which drove ashore on Cape Cod three months ago on her way to unload 58 chests of tea in Boston. Right after the tea party, young Jonathan Clarke, scion of the shipping family that lost so heavily when the other tea cargoes were dumped into the harbor, set out for Provincetown at the tip of the Cape to save what he could of this one. He rounded up some experienced salvagers, commandeered a schooner and rescued *William*'s cargo.

Clarke brought his salvaged goods across Massachusetts Bay to Castle William, in Boston Harbor. The streetlamps were greeted with joy, but now, as people bask in their glow, they ask each other what happened to the tea. Was duty paid on it?

No one knows for sure. Rumors fly that some chests were used to pay off the salvagers. Cape Cod militants, angry at having Clarke pull off his little stunt right under their noses, apparently tracked down one chest and burned it. Most of the rest seems to be in Castle William, and the Sons of Liberty intend it to stay there, no matter how tempting it is to citizens whose patriotism may weaken.

The price that Boston will have to pay for its tea party is now being debated in Parliament. It amounts to a closing of the port—virtual economic death for the Colonial city. Both the Secretary of State for the American Colonies, Lord Dartmouth, and the Prime Minister, Lord North, are at first uneasy about the extremity of this measure. They view the Colonies as children of the Mother Country and, though one of them certainly deserves punishment for its naughtiness, it

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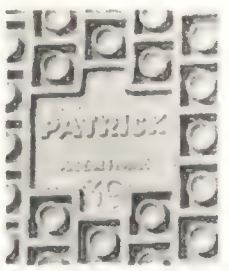

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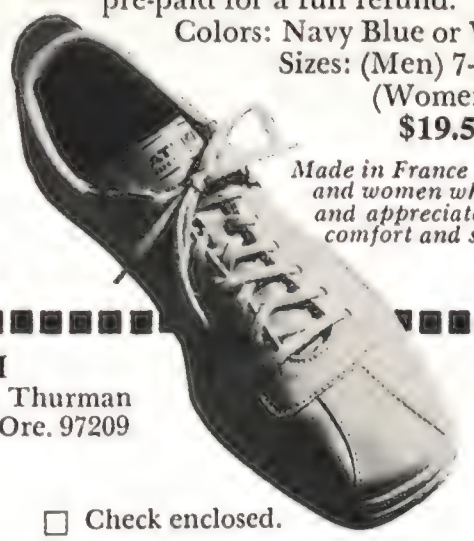

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should be in the form of some action more maternal and less drastic.

Popular feeling in London, however, calls for real vengeance. Letters flood the newspapers with savage suggestions: Ship certain goods to America *without* requiring duty—things like artillery and cannonballs to insure that the Bostonians will drink tea again "without making damned wry faces"; try boycotting American tobacco and see how the Colonists like *that*!

Dartmouth and the pro-American Whigs who have so often espoused the Colonial cause—Lord Chatham, Edmund Burke, Charles Fox and other leaders—cannot stem this tide of anger, although they warn of Boston's unsubmissive mood and the threat of armed resistance to British troops if regiments are indeed needed to enforce the closing of the port. Nonsense, say the hard-line advocates. No less an authority than General Thomas Gage, who has served so long with the Americans that he married one of them, has told the King that "they will be Lyons whilst we are Lambs, but if we take the resolute part they will undoubtably prove very meek." Dr. Johnson has summed up the prevailing opinion of the Americans: "They are a race of convicts, and ought to be content with anything we may allow them short of hanging."

The Boston Port Bill passes both houses and is signed by the King by the end of this month. England's soft spring is touching London when the work is finished, and the Members of Parliament stroll the Thames embankment, sighing with satisfaction at another unpleasant task done, another winter passed.

This month marks the 23rd birthday of James Madison, a most serious young man presently reading law in his native Virginia. In the wooded border where the Carolinas meet the dark Indian lands of the Appalachians a frontier boy also has a birthday. Doubtless he is missing a few front teeth, for he is just seven. His name is Andrew Jackson.

Spring is late in the mountains of western Virginia and Pennsylvania, near the icy Ohio River. And tensions mount between settlers and Indians—mostly between Virginians and Shawnees, though the former are quite apt to take a few shots at the Pennsylvanians and the Shawnees are not above scalping an occasional Cherokee.

EDWARDS PARK

Next month: Lord Dunmore's war

Bonaparte au Mont St.-Bernard. Peinture par Jacques-Louis David. (Musée de Versailles)

Like Hannibal and Charlemagne before him, Napoleon boldly crossed the Alps into Italy by the Great Saint Bernard Pass on May 15, 1800. An army of 40,000 men, with field artillery and baggage trains, completed the exhausting journey five days later, and went on to win the battle of Marengo on June 14th.

COURVOISIER
COGNAC

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By Jerrold L. Schecter

Bad old Shanghai has turned into a showplace of new China

Disciplined, vigorous throngs hold sway where once the 'foreign devils' reigned supreme and dogs and Chinese were equally unwelcome

Shanghai is the power center for China's new self-esteem. The biggest, most productive port city in the People's Republic has undergone "struggle, criticism and transformation," replacing its bawdy imperialist past with a prim, gray energy and efficiency. Shanghai sets the nation's Maoist standards and styles. Within the limits ordered by the Communist party, Shanghai is the political and cultural innovator, still the most cosmopolitan of China's great cities and the urban center where most Chinese would prefer to live.

Since the Chinese Communists took power in 1949, Shanghai has been transformed from a glittering pleasure dome, with searing contrasts between wealth and poverty, to the egalitarianism of Mao's China. With a new sense of purpose, Shanghai remains vital, throbbing and growing. The old city with its broad streets and high-rise buildings still reflects the days when it was an international colony of British, French, Americans, Germans, Russians and Japanese. But a walk along the Bund that faces onto the Whangpoo River reveals the range of the revolution. Red and blue signs flash over the old bastion of foreign capital, proclaiming "Long Live Chairman Mao," or exhorting people to "Maintain independence, keep the initiative and rely on our own efforts." The Garden Bridge that once separated the foreign enclave has been renamed "Waipetu Bridge," literally "bridge that foreigners crossed free."

By seven o'clock on any morning the neatly trimmed park in the Bund is filled with young and old practic-

Early morning on the Bund finds citizens practicing traditional exercise, *t'ai chi chu'an*.

ing their traditional exercises (see cover) of *t'ai chi chu'an*, ritual movements. This is the same park where in the old days two signs were prominently displayed. One said: "No dogs allowed." The other read: "No Chinese allowed."

The custom house clock tower that intoned hourly chimes, as does Big Ben in London, now plays the opening bars of "The East is Red." The former Hong Kong and Shanghai Bank building, with its gray columns and glaring bronze lions still shining from the hands that have touched them for good luck, is now the headquarters of the Shanghai Municipal Revolutionary Committee. Instead of armed Sikh guards with shotguns at its massive front doors, there are two khaki-clad People's Liberation Army soldiers with grim stares and submachine guns. The Shanghai Club, once an exclusive British preserve with, reputedly, the world's longest bar, is now an international seaman's club run by the city. The spacious grounds and buildings of the British consulate have been turned into "friendship stores," where foreigners can purchase Chinese products and antiques.

With its central geographic position ideal for internal trade, Shanghai, 15 miles up the Whangpoo River from the Yellow Sea, is also the nearest Chinese port to Japan and it lies directly on the shipping lane from San Francisco to Singapore. First opened to foreign trade in 1842 as one of the original treaty ports, Shanghai became the epitome of imperialism. When the late Edgar Snow, a long-time friend of China and its Communist leaders, first visited Shanghai in 1928 he found the streets of downtown Shanghai like "a continuous freak circus." Shanghai, wrote Snow, was "unbelievably *alive* with all manner of people performing almost every physical and social function in public: yelling, gesturing, always acting, crushing throngs spilling through every kind of traffic, precariously amidst old cars and new ones and between coolies racing wildly to compete for ricksha fares, gingerly past 'honey-carts' filled with excrement dragged down Bubbling Well Road, sardonically past perfumed, exquisitely gowned, mid-thigh-exposed Chinese ladies, jestingly past the Herculean bare-backed coolie trundling his taxi-wheelbarrow load of six giggling servant girls en route to home or work, carefully before singing peddlers bearing portable kitchens ready with delicious noodles on the spot, lovingly under gold-lettered shops overflowing with fine silks and brocades, dead-panning past village women staring wide-eyed at frightening Indian policemen, gravely past gambling mah-jongg ivories clicking and jai alai and pari-mutuel

Jerrold L. Schecter, the diplomatic editor of Time, *visited Shanghai with President Nixon in 1972, lingered on his own, then returned there a year later.*

Soochow Creek, crammed with barges, flows below clock tower of the old post office building.

betting, slyly through streets hung with the heavy-sweet acrid smell of opium, sniffingly past southern restaurants and brightly-lighted sing-song houses, indifferently past scrubbed, aloof young Englishmen in their Austins popping off to cricket on the Race Course, snickeringly around elderly white gentlemen in carriages with their wives or Russian mistresses out for the cool air along the Bund and hastily past sailors looking for beer and women—from noisy dawn to plangent night the endless hawking and spitting, the baby's urine stream on the curb, the amah's scolding, the high falsetto of opera at Wing On Gardens where a dozen plays went on at once and hotel rooms next door filled up with plump virgins procured for wealthy merchants in from the provinces for business and debauch, the wail of dance bands moaning for slender be-jewelled Chinese taxi dancers, the whine of innumerable beggars and their naked unwashed infants, the glamor of the Whangpoo with its white fleets of foreign warships, its shaggy freighters, its fan-sailed junks, its thousand

Photographs by Takeyoshi Tanuma

A new face for old Shanghai

lantern-lit sampans, darting fireflies on the moon-silvered water filled with deadly pollution. Shanghai!"

Shanghai today is a shadow of its lurid past. The pursuit of pleasure has been channeled and restrained, become ordered, puritanical and didactic under the command of the Chinese Communists. Street committees maintain discipline and surveillance. The street performances that Edgar Snow and his generation of foreigners observed have become a pantomime of the past. The unbridled intensity has been reined under the control of the Shanghai Municipal Revolutionary Committee and local organizations of workers, peasants and soldiers.

Much of the old foreign-built city has been allowed to molder and decay. Churches have been turned into light-bulb factories and warehouses. Once-elegant walled private homes have been divided into communal apartments. Yet despite the aged exterior, Shanghai has a new kind of inner exhilaration that stems from its people's discipline and headlong thrust to expand industry and agricultural production.

Everybody works. Manual labor is the new common denominator and unifier of Mao's socialism. Ideology has been translated into the specifics of building retaining walls for irrigation, ladling night soil, digging trenches and harvesting rice. Self-sacrifice and self-reliance are the slogans that have survived the Great Proletarian Cultural Revolution that began in 1965 and ended in 1971. Office workers spend at least one day a week performing manual labor in factories and farms around Shanghai.

The city has spread and grown to the size of the state of Rhode Island, with the biggest growth in large satellite industrial towns, in the rich countryside where agricultural and fish growing communes abound. The inner city's population is now estimated at six million, while four million more live in the new towns such as Pangpu with 16,000 to 20,000 people.

Downtown Shanghai is still crowded and there is an overwhelming sense of the population pressure of China on Nanking Road, the main shopping street. Bicycles clutter the roadway (two million are registered) as they thread their way past lines of hand-drawn carts piled high with goods. Cars are a rarity, and Shanghai is probably the antique car capital of the world. On any day there is a vintage showing of Packards, Austins, LaSalles, DeSotos and prewar Fords and Chevrolets, all in seemingly perfect repair. The only new cars are from the Shanghai Auto Factory, plus a few Japanese imports used for officials and tourists. Autos for private use are nonexistent. Traffic is directed by Chinese policemen who have their headquarters in the old American Club.

No night life these days

The pleasures of Shanghai nowadays are simple. Opium smoking and drugs have been eliminated, and there is no organized prostitution in what the Chinese claim is the world's largest municipality. There is no night life in the Western sense, no bars, nightclubs, bowling or discotheques. Culture is all revolution-oriented. There are revolutionary operas and ballets under the aegis of Chairman Mao's wife, Chiang Ch'ing. These all carry an anti-imperialist message and are supplemented by films of revolutionary operas and the exploits of Communist guerrillas fighting the Japanese with mine and tunnel warfare. The traditional Chinese circus and acrobatics (p. 30) have been fostered by the Communists, and exhibit their traditional skills while employing new themes that stress the good relations between the People's Liberation Army and peasants and workers.

For the Chinese on his one day off each week, recreation consists of a visit to a park or zoo, a movie, shopping or a family meal in one of Shanghai's still excellent restaurants. The Bund is a favorite spot for sightseeing and posing for pictures. In the evening young couples stroll along the Bund; some even hold hands now that the Cultural Revolution has abated.

The traditional Chinese greeting is, "Have you eaten today?" and the importance of food is a national fixation well exemplified in Shanghai. In the early evening the roads into Shanghai from the outlying communes turn into endless belts of green; slowly the carts of cabbages, broccoli, spinach, lettuce and bamboo shoots are hauled to market by patiently pushing and pulling peasants. Shanghai is famous for its freshwater shrimp, cooked quickly with fresh spinach leaves to preserve the delicate flavor, and freshwater crabs, boiled and served with a delicate ginger spiced vinegar sauce.

Cycling commuters cross Waipetu (formerly Garden) Bridge at 7 a.m. Trucks will follow in an hour.

Industrial exhibition in Chingan District displays new *Hung Chi* car for North Korean tourists.

Balancing act enlivens Shanghai's Circus Theater. Admission fee is the equivalent of 20 cents.

The Broadway Mansions, billet and playland for American officers at the end of World War II, has been refurbished and renamed the Shanghai Mansions and now serves as the center for Communist Party functions and entertaining. The cooking is still superb and foreign visitors can reserve a dining room. The white-coated staff includes many of the old "boys" who still speak English but gently refuse tips after an elegant five-dollar meal that includes a cold meat and fish plate designed to resemble a multicolored and scaled dragon, sliced pheasant and snow peas, melon soup, sharks' fins, tender broccoli and dumplings shaped and colored like goldfish.

Self-criticism always the rule

For ordinary eating with "the broad masses" there is the Canton Restaurant on Nanking Road. Here a seven-course meal for two cost me only $2.40 and included cold hors d'oeuvres, freshwater shrimp, roast duck, yellow fish in white wine and beer. Families, including aged grandparents, sit at round tables eating sweet and sour fish and rice. Then they collect the leftovers in metal lunch boxes to feed to the pigs on their private plots. Like every such establishment, the restaurant has a criticism book where customers register complaints and suggestions. The cooks and waiters study the comments in weekly mass-criticism sessions.

Self-criticism extends to all areas of life. Headed back to Shanghai at high speed from a commune, the driver of our car suddenly spotted a bicyclist in the dusk ahead, in the center of the road completely unaware of our approach. Our driver swerved to avoid the youth, but our rear tires skidded on the muddy shoulder of the road, spinning our car around and smashing the rear fender against a tree. We were all shaken but unhurt. The cyclist also escaped injury. Our car was a mess. I asked our interpreter what would happen to the driver and how the accident would be handled. I explained that in America the car would be covered by insurance, but that the driver would be considered partly at fault because he had been going too fast.

"In China there is no insurance," the interpreter said. "The driver will undergo self-criticism. He will analyze his faults and those of the bicycle rider and make a full report. Depending on his attitude and his analysis, his punishment will be determined. Most likely he will receive a reprimand."

For the Chinese, Shanghai is still a showplace and they proudly take visitors to the Shanghai Industrial Exhibition where thousands of products made since the revolution are on display. The theme of self-reliance is stressed, and the Chinese proudly point to machine drill presses, grinders, movie cameras and

prototype computers, all produced in China. A favorite of Asian visitors is the *Hung Chi* or Red Flag, the Chinese luxury limousine (p. 29) that is assembled and finished by hand. It looks like a cross between a Cadillac and a Russian Chaika sedan. The exhibit also includes displays of the latest Chinese medical techniques in restoring severed human limbs, eye operations and traditional acupuncture techniques.

During three trips to China, only twice, at state banquets, did I see what appeared to be a slight use of make-up on young women. But at the Shanghai Industrial Exhibition I saw displayed different shades of lipsticks and a variety of rouges and face powders. When I asked a guide who bought them, she twittered and replied: "Oh, they are for export, we do not use them. Chinese women prefer the natural look."

Never did I see a woman wearing a skirt, only pants and overalls. The brightly printed and patterned textiles on display are primarily for export. The most frequently worn Chinese colors are brown, blue and gray. Yet style in fashion is returning to Shanghai. In the year between my visits to Shanghai I noticed more color had come into clothing, and the boxy, baggy look in Mao jackets had diminished, giving way to trimmer, more tailored jackets in a wider range of fabrics. Cheap cotton is being supplanted by synthetics and wools. Styling revolves around differences in collar shapes, length and the number and placement of pockets. The emergence of color in clothing is more evident in children's wear, with a growing variety of colors and styles in shirts, pants, sweaters and jackets.

Girl makes radio parts in the machine plant of a new model commune. It was once a slum.

Children are special

If there are privileged people in China today, they are the children. Special nurseries, schools, diets, medical care and cultural programs have been developed for China's youth. After the normal school day at the Shanghai Children's Palace, formerly a British businessman's mansion, 2,000 children under 16 learn the three great revolutionary movements: class struggle, the struggle for production and the struggle for scientific experiments. Activities include model-building of telephones and radios, revolutionary operas, table tennis and learning to handle and shoot guns.

For everybody the workday is long. On the communes around Shanghai it begins at dawn and bedtime is by 9:30 P.M. There is no television yet in the communes. There is only radio, broadcast on loudspeakers from a central receiver. In the city there is black-and-white television two or three times a week, featuring programs of revolutionary operas and plays, travelogs from other parts of China demonstrating the growth and building of socialism, and important news events such as the visit of President Nixon to China or

Cobbler works at a street corner shoe-repair shop. Here, too, are stalls selling candy and tea.

Crowds line up for fish, pork or vegetables at Sanchioti market place in the Hungkow District.

Family dines in Pangpu, a new town. Rent runs $2.04 a month; salaries total $51.00 a month.

Secretary of State Henry Kissinger's meetings with Chairman Mao. There are only an estimated 500,000 TV sets in China, with an annual production estimated at 60,000 to 75,000 black-and-white sets. A set costs about $175 and is the equivalent of six months' salary for a worker. TV sets are not individually owned, but usually are purchased by factories, offices, hotels and municipal groups and placed in central recreation rooms for wide viewing.

While TV sets are out of the reach of the average workers, radios have come down in price and are the most popular consumer luxury item in China today. The radio counter is always jammed with potential purchasers and a full line of spare parts is also stocked for home repairs. In China today the luxury items, along with radios, are watches and clocks, bicycles and sewing machines.

Newspapers in Shanghai reflect the revolutionary purity and puritanism of the Cultural Revolution. They are a model in miniature of how life should be conducted in Maoist Shanghai. The city's leading paper is the *Wen Hui Bao* (Literary Gazette), which launched the Cultural Revolution for Mao from Shanghai in 1965 and has increased its circulation from 140,000 to 800,000. More than any other Chinese newspaper, *Wen Hui Bao* has been the voice of Chairman Mao.

Unlike the West, China has no newsstands. All distribution is handled by subscription through the central post office, and the price for a daily newspaper comes to about two cents. Most Shanghainese, however, prefer to get their news standing up by stopping to read the papers prominently posted in glass cases in parks or on kiosks around the city.

A typical issue contains a page of metropolitan area news, a page of domestic news, a page for the study of Marxism-Leninism and a page of international

news from the New China News Agency ticker. Investigative reports dig into how workers of the Number One Commercial Bureau persisted in studying and developing Mao Thought. Literary pieces are usually devoted to boosting the revolutionary operas that are Madame Mao's special interest. There is no crime reporting.

In Shanghai, as in the rest of China, everybody works six days a week, eight hours a day, without any annual vacation. The only official days off are the two-day Lunar New Year, the Summer Festival, May Day and the Anniversary of the Revolution, October 1.

Shopping is a favorite pastime and stores are open until 8 P.M., but since work shifts are staggered around the clock in many factories, there are stores open 24 hours with basic food and clothing for sale.

No running water in new flats

What is most striking about the life-style of Shanghai and its satellite communities is its basic simplicity, yet there is an obvious effort to improve, no matter how basically, the standards of food, clothing, shelter and medical care. At the Hsuhang People's Commune, 24 miles from downtown Shanghai but still a part of the city, I saw a new concrete-and-brick residential block of flats built for the Chingchiao production team. There was no running water in the flats; each family hauled cold water from a communal pump or received hot water at a central kitchen. The flats consisted of two rooms and a small terrace for drying clothes and food. Farmer Fan Ku-tso and his wife were proud of their new flat with its wood-burning stove for cooking, but they were even more pleased to show pictures of their three sons who are serving in the People's Liberation Army. The whitewashed concrete wall of the flat was decorated with an army New Year's greeting. Mrs. Fan works in a state textile factory and earns the equivalent of $35 per month. Mr. Fan had amassed 4,000 work points for his labors on the commune and he too earned the equivalent of $35 per month. Most of their savings had gone to buy a traditional hand-carved marriage bed for their eldest son as a wedding present. Like other members of the commune, they used public toilet and bathing facilities.

Despite the simplicity of his home, Mr. Fan proudly contrasted it with his pre-Communist lot when he was constantly in debt to his landlord and lived in a straw hut with a lean-to roof. "Then, my only possessions were my clothes. Now I own a bicycle, tables and chairs, a chest, some books and a clock," explained Mr. Fan. At the production brigade, visitors are told that members do not pay for food or rent and that the 227 members have among themselves 56 bicycles, 76 watches and 13 clocks.

Shanghai citizens crowd a sidewalk bulletin board to read the newspapers always posted there.

A couple stroll on their day off where coolies once struggled with rickshas. Few soldiers are seen.

A new face for old Shanghai

Like all the factories I was shown, the commune had its own hospital with both Western and traditional Chinese medicine wings. Birth control was heavily stressed and a separate gynecology section offered free dosages of pills, hormone injection or abortions.

The Chinese medicine section exuded a rich aroma of herbs, wood oils, dried fruits and mineral extracts. There were dried wild date skins to be boiled for a sleeping potion, sliced roots for headache relief and powdered minerals to stimulate the flow of blood and calm digestive disorders.

A young girl suffering from arthritis was lying on a bed with acupuncture needles in her foot and holding a burning moxa punk next to the needles to heat them gradually and increase their effectiveness. Fascinated, I asked the doctor to show me how it worked. He plucked a needle immersed in alcohol from a covered jar and plunged it into the skin between my thumb and index finger. The sensation was similar to receiving an injection. Then he twirled the needle between his fingers and a tingling rippled through my arm along with a numbing sensation. "Thanks. That's enough. I think I understand now," I said, and the Chinese who had gathered to watch laughed.

Still the cultural center

The birthplace of the Chinese Communist Party in 1921, Shanghai remains in the vanguard of intellectual, cultural and political activity in China. Sun Yat-sen, the founder of modern China, lived in Shanghai when he plotted the overthrow of the Manchu Dynasty. His widow, the ailing Soong Ching-ling, (a sister of Madame Chiang Kai-shek) still holds the title of state vice chairman and lives in her old home in Shanghai, but is rarely seen in public. Shanghai provided the political support for Chairman Mao to launch, in the winter of 1965, the Great Proletarian Cultural Revolution, which purged and reshaped the Chinese Communist system.

Shanghai's political leadership played a major role in the Cultural Revolution, forming a broad base of support for Mao and his wife Chiang Ch'ing. Today the Shanghai leadership constitutes an important power faction in the ruling politburo in Peking.

Shanghai was the site of the historic joint communiqué between the United States and China during President Nixon's visit to China in February 1972. The communiqué, which opened the way to improved diplomatic relations and trade between the United States and China, stressed that normalization of relations "is not only in the interest of the Chinese and American peoples but also contributes to the relaxation of tensions in Asia and the world."

Since President Nixon's visit, Americans have been welcomed to Shanghai. Normal tourism is still not possible, but American academic, medical, sports, scientific and technical groups have been invited. The old imperialist Shanghai, with its guarded enclaves of privilege and walls topped with broken glass, is dead. The old city had no counterpart in Western life, yet the new Spartan Shanghai is exotic in its own way, an experiment to train and channel human behavior in a pattern never before attempted successfully. As the Communists continue their efforts to keep their revolution pure and self-perpetuating, the contrasts between Shanghai and the West remain vast.

At Children's Palace, formerly a British mansion, target practice is held under a defense slogan.

Girls jog around a swimming pool. It serves the special schools for mill workers' children.

By Edward Edelson

A device which peers into flies' eyes

Only recently developed, scanning electron microscopes are putting scientists in touch with a brand-new world of 3-D detail

Almost certainly, you have seen the pictures. A fly's head, magnified more than 100 times, in such realistic three-dimensional detail that it seems to jump out of the page at you. The eye in that head is magnified more than 1,000 times in even more exquisite detail. A human hair, at 3,300 times real life, looking like a tree trunk. A whisker stub, the size of a tree stump, with the hack marks of the razor clearly visible.

These pictures are produced by an instrument that came on the market less than a decade ago, a new idea in microscopy that gave scientists a new view of nature —the scanning electron microscope. Scientists, with their fondness for jargon and abbreviations, call it the SEM. It is one of the few truly original ideas in the nearly 400 years of microscope history.

First there was the light microscope. You focus a beam of light on a specimen, manipulating the light waves with optical lenses, usually made of glass, to produce an enlarged image of the specimen. The instruments used in the 17th century by the pioneering Dutch microscopist, Anton van Leeuwenhoek, had a magnifying power of about 160. Today's light microscopes can produce magnifications of more than 2,000 times. But the limitation of these microscopes is not magnifying power but resolution—the ability to distinguish fine detail. And, as the German physicist Ernst Abbe calculated a century ago, the limits of the light microscope are set by nature: A light microscope can never have a resolution that goes beyond the wavelength of the light it uses. The measurement used in

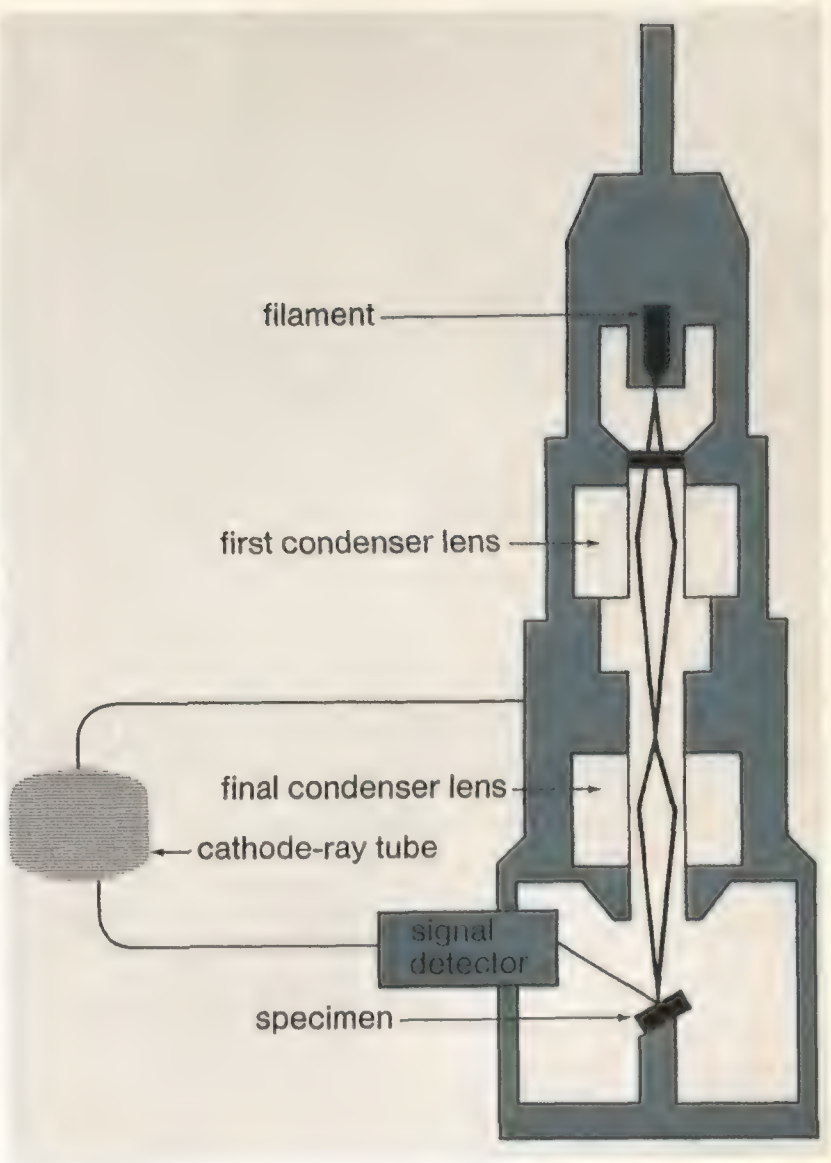
As if it were crying "Eeek," this mouse cell, shown 15,000 times actual size, contracted rapidly and

modern microscopy is the angstrom unit, one ten-billionth of a meter, and modern light microscopes are limited to a resolving power of about 2,000 angstroms.

So it remained until the 1920s, when the French physicist Louis de Broglie showed that elementary particles, such as electrons, also have the characteristics of a wave. The wavelengths of electrons were shown to be thousands of times shorter than the wavelengths of light, and so the electron microscope was born. Scientists can cut a very thin slice of a specimen and, using electromagnetic fields as lenses for focusing electrons, shoot a beam of electrons through it and view the greatly magnified image on a fluorescent screen or capture it on photographic film. The resolving

Mr. Edelson, science editor of the New York Daily News, *described an improvement in x-ray technology called density slicing, in* SMITHSONIAN, *August 1973.*

developed bubbles on its membrane—evidence of displeasure at being treated with a chemical.



In a scanning electron microscope, a fine beam of electrons sweeps back and forth across specimen, knocking electrons from it. The secondary electrons are picked up by detector and applied to TV tube which scans in synchronization with electron beam. Photographs on these pages are made from TV screen.

power of electron microscopes has improved steadily and the newest and most powerful models have a resolution approaching two angstroms.

That's fine, but not perfect. The weakness of the standard (or transmission) electron microscope is not its resolution but its realism. Inevitably, you lose a lot in realism when the only way you can magnify something is to cut it into wafer-thin slices. Practically speaking, such images show only two dimensions. The idea of an electron microscope that would sacrifice something in resolution for a gain in reality was born in the 1930s, and in 1965 the first commercial model, developed in England, became available.

The way the SEM makes its images has a lot in common with the way your television set works. Start with a filament that produces a shower of electrons. Focus that shower into a fine beam, perhaps 200 angstroms wide. Then spray that beam across your specimen, moving it down one notch at a time, until the beam has swept across every point on the specimen (this is called "scanning"). When the electron beam hits the specimen, it knocks loose electrons from atoms that make up the specimen. The number of these secondary electrons knocked loose varies, depending on the composition of the specimen and the angle at which it is struck by the electron beam. More are knocked loose when the beam hits head-on than at an angle. These secondary electrons, captured and processed, create pictures on a video screen that have the appearance of depth and three-dimensional contour—the hallmark of the SEM. The pictures on these pages are simply photographs made from the SEM's video screen.

The job of preparing a specimen for the SEM is much simpler than for a conventional electron microscope. If the specimen is hard and conductive enough, you can put it in the microscope as is. But most of the

time, something like chemical fixation and freeze-drying or coating with a metal that is a good emitter of secondary electrons (a gold-palladium alloy is quite popular) produces a better picture.

SEM pictures make fascinating viewing for anyone, scientist or not, but an SEM picture is more than just another striking image. In the right hands, it is a scientific tool of great value, capable of yielding important information that would otherwise be unavailable.

For example, Richard H. Benson, curator of the Department of Paleobiology at the Smithsonian Institution, has been spending much of his time lately studying fossil ostracodes (see page 39), tiny crustaceans contained in cores drilled deep in the ocean floor. The skeletal structure of these animals varies with changes in water depth and temperature, so a careful study of ancient ostracodes can give precise information about the history of the ocean basins. Ostracodes are only a millimeter long, however, no bigger than the head of a pin. No matter how hard you try, many details of the ostracodes blur out through the light microscope.

Enter the SEM, which, Benson says, "has allowed us to see details that we otherwise couldn't touch, and in a greater depth of field than ever before. Now we can precisely follow every one of the very subtle differences in sculpture on the shells that are preserved as fossils." Benson mentions the saving in time. To capture details through the light microscope, you had to stare for a long time and then sketch by hand, taking hours or even weeks. The SEM does it in a few moments and so much better that Benson says "we're practically in the ostracode architectural business. We can now think in terms of the adaptive, structural mechanics of these animals, based on the new detail shown by the scanning electron microscope."

At the New York Botanical Garden, botanist Bassett Maguire says the SEM gives him a similar advantage in his intensive study of pollen grains. The classification of pollen by form and external appearance, he says, is "extremely useful in the systematic study of genera and species with which we are dealing."

Medical researchers also are using the SEM. At the Forsyth Dental Center in Boston, researchers are studying the bacteria that collect to form plaque, the gooey tooth coating that plays a major role in both tooth decay and periodontal disease. One of the interesting phenomena in plaque is the "corncob" (see below), in which spherical streptococcal bacteria will cluster on a rod-shaped bacterium.

"If you look at it through a standard electron micro-

Magnified 70 times, this clublike balancing organ of a fly sits in a socket and vibrates during flight.

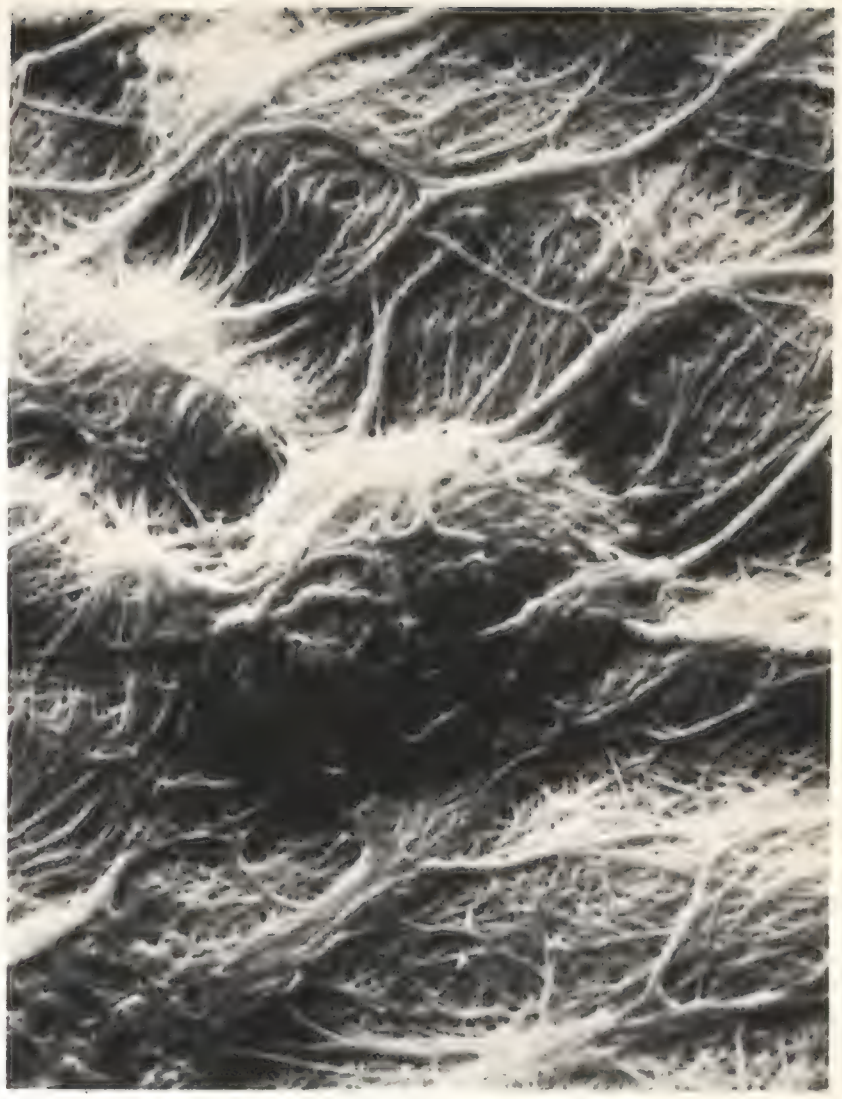
Bacteria congregate in corncob-like formations and cover teeth with dental plaque (enlarged 5,000 times).

scope, it looks like a bunch of circles drawn along an oblong structure," says Dr. Ziedonis Skobe of the center's electron microscope department. "If you look with the scanning electron microscope, it looks like a corncob. Looking at one of those pictures is enough to make anyone want to brush his teeth."

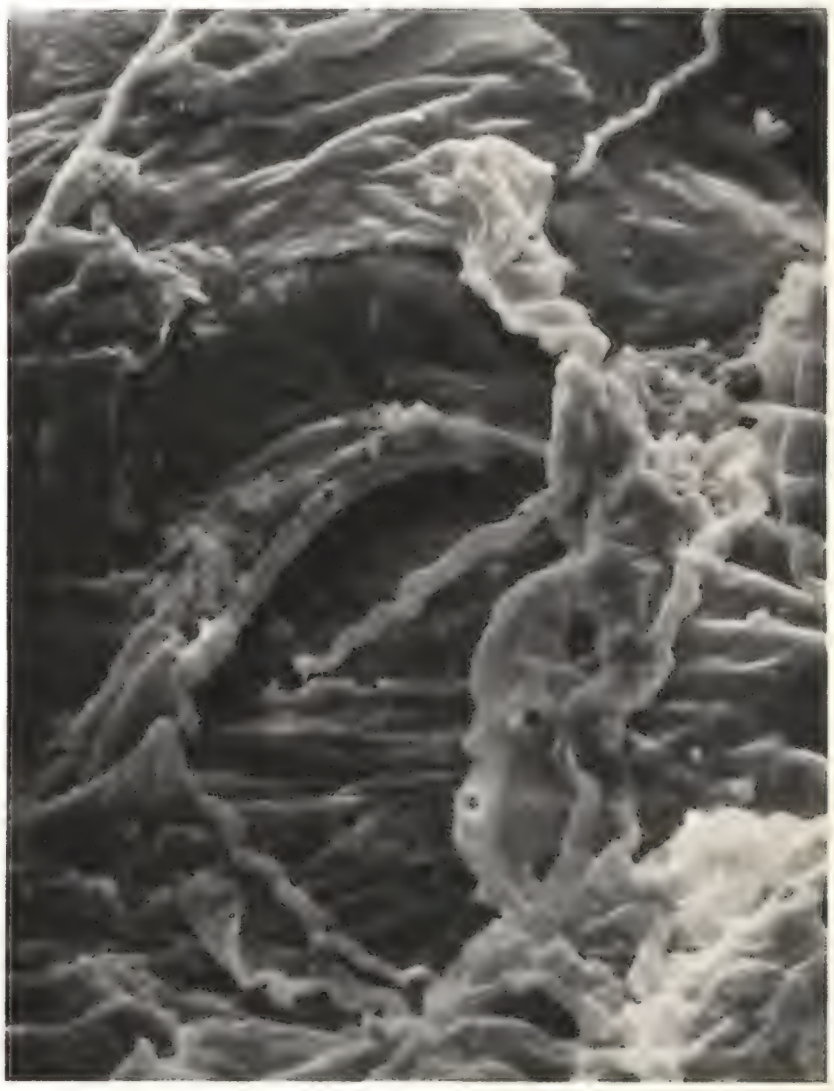
At the Touro Infirmary Research Institute in New Orleans, Dr. Irving Redler is using the scanning electron microscope to study cartilage changes in osteoarthritis, the "wear-and-tear" arthritis that touches many Americans as they grow older. Redler started his studies with a conventional electron microscope, but he found himself bothered by its shortcomings. "You can only look at little bits of tissue," says Redler. "However, the scanning electron microscope has been fantastic. You can examine a piece of cartilage tissue from the surface to the bone, as one continuous piece. It shows us things we can't see any other way."

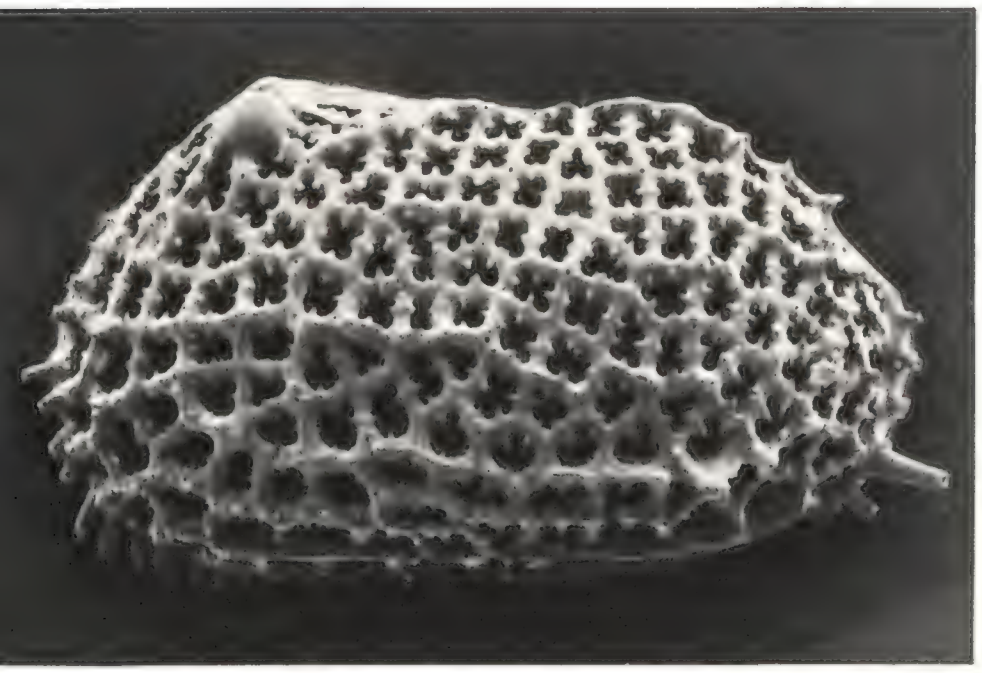
With the SEM, Redler has been able to follow the degenerative changes caused by arthritis. The surface of normal cartilage (at right, above), he finds, is a dense network made of fibrils of collagen, a tough, stringy protein. In arthritis, the fibrils become twisted into tortuous configurations. The subsurface structure, under SEM examination, proves to have fluid-filled spaces that provide "a beautiful shock-absorber effect." The tissue can deteriorate, with the fluid-filled cells becoming obliterated. Since cartilage cells depend on this fluid for their nutrients, Redler is working on a theory that this change is a major factor in the progress of the disease.

On a more basic level of research, scientists at Rockefeller University and Sloan-Kettering Institute for Cancer Research in New York turned the SEM on human



The network of fine fibrils above is of normal cartilage (magnified 3,000 times) but tortuous formations below (magnified 1,000 times) are from osteo-arthritis.





Filigreed skeleton of a modern species of ostracode is readily apparent when magnified 110 times.

lymphocytes, the white blood cells that govern the body's immune defenses (see SMITHSONIAN, January 1974). Dr. Jean-Paul Revel, a biologist at the California Institute of Technology, uses the SEM to study a different kind of cell: the cells that differentiate into the tissues of an animal embryo. Most knowledge about this kind of cell, Revel says, comes from cell cultures. He is trying to determine whether cells from chick embryos, such as those in connective tissue, behave differently from cells grown artificially in petri dishes. So far, he says, the answer is yes. More work with the SEM is expected to show exactly what the differences are and how some cells—for instance, cancer—grow and migrate.

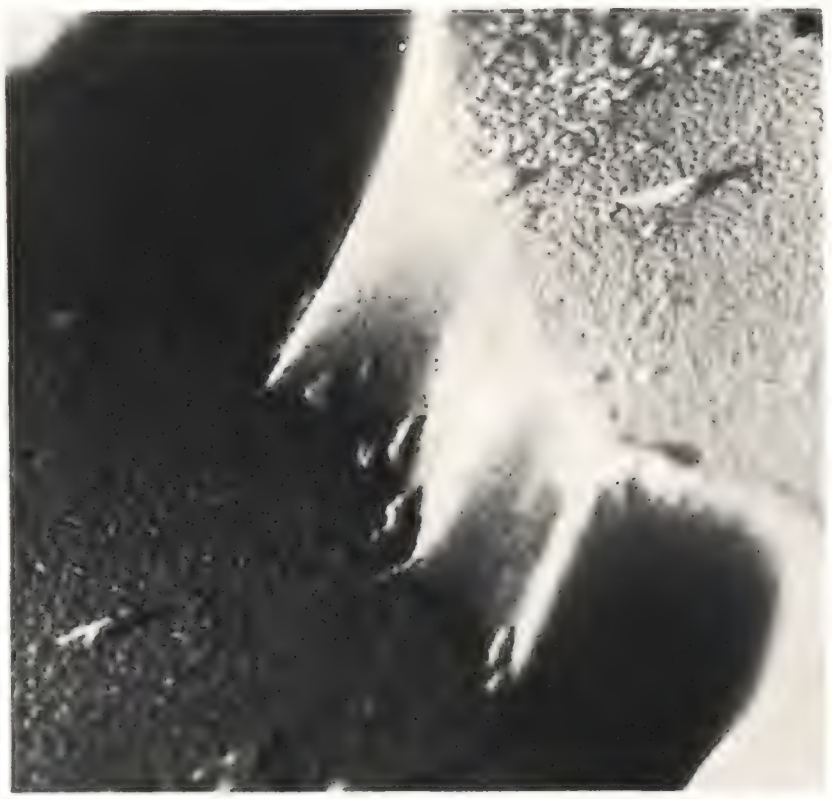
It is not only in biology that the scanning electron microscope has proved its worth. The SEM is a tool for technology. International Business Machines, for example, has about two dozen SEMs in its various laboratories. At IBM, miniaturization is one major use for the SEM. In the world of electronics, size means both time and money. Not only can you increase the speed of an electronic device by reducing the size of its solid-state circuits, but you can also reduce costs by squeezing more circuits onto a semiconductor chip. The drive to miniaturize has reached the point where experimental circuits are so small that they are almost invisible in a light microscope.

The scanning electron microscope is a production machine for these circuits. The SEM's electron beam is first used to sensitize the semiconductor surface in the same way that light waves sensitize photographic film in your camera; then esoteric techniques are used to etch away the sensitized portions, thus creating a miniature circuit that may include thousands of individual electronic components. At this point, the SEM turns into a tool for testing: The circuits are so small that the only known way to check them is to take their picture with the scanning electron microscope.

A team of IBM scientists recently announced a development that could extend the usefulness of the SEM by improving its resolution. Most SEMs used to examine solid samples have a resolution of about 150 angstroms, 10 times better than light microscopes but appreciably worse than the best conventional electron microscopes. By putting the specimen in the focusing lens, the IBM researchers say, they can resolve details to perhaps 30 angstroms now, 10 angstroms ultimately.

Such an improvement could be of great importance in producing tomorrow's electronics. The Josephson effect (a very fast electronic switching effect which takes place in superconducting material), for which Brian Josephson won the 1973 Nobel Prize for Physics, is expected to generate new electronic components that are much faster than any now in use. The Josephson effect depends on having an extremely thin layer of material, 10 or 15 atoms thick, between two layers of superconducting material. The only way to check on this junction, which measures in the neighborhood of 50 angstroms, is with the SEM.

And so it goes. The important thing to remember is that the SEM is still less than a decade old. Such a healthy baby is bound to have an exciting maturity. Even now, hardly a month goes by without a scientist in one discipline or another reporting on some development that would be impossible without the SEM.



Enlarged 85,000 times, a layer of silicon dioxide shows on surface of a chip used as an electronic device.

A fly uses complex tongue in the manner of a sponge. Its spiral edge is magnified 2,500 times.

Medieval tapestry masterpieces cast new spell in a spectacular show

In this detail of *Sight* from the renowned *Lady with the Unicorn* series (a set of six 15th-century tapestries, belonging to the Cluny Museum in Paris), the virgin maiden captures attention of the unicorn, otherwise known to be ferocious, and shows the animal its reflection in a hand mirror.

By Robert Wernick

Nearly 100 treasures, woven on the looms of France and Flanders, are on view at New York's Metropolitan Museum of Art

Tapestries in the Middle Ages were, to begin with, utilitarian objects. Hung against the bare stone walls of castles and churches, they protected people from the drafts and the damp. But they were also admired as works of art, for the Middle Ages made none of the distinctions that we make between the practical and the esthetic, between fine and applied art. All art was intended to decorate and brighten and serve the needs of daily life, and the men we know today only as great painters or sculptors—Jan van Eyck, Claus Sluter and the rest—spent only part of their time on the altarpieces and portraits and tombs which are regarded today as among the summits of human achievement.

They spent as much or more on pursuits which seem to us to be peripheral or wholly frivolous, like painting the sails of the war fleet of the Duke of Burgundy, or designing stage settings and backdrops and *tableaux vivants* for tournaments, festivals and gargantuan banquets. And they made designs, too, for the master weavers on whose looms the great tapestries were woven.

Tapestries were then considered more valuable than paintings, if only because of the huge amounts of gold and silver thread which figured in them, along with the wool and silk. Except in rare cases, where a piece has a signature woven into it or where documents relating to its original purchase have survived, no one knows the names of their makers. Yet the greatest talents of the times must have contributed to the weaving art at its height (roughly, the 200 years between the mid-14th and mid-16th centuries).

Ninety-seven glorious examples are included in the superb exhibition, "Masterpieces of Tapestry," currently on display (through April 21) at the Metropolitan Museum in New York. The show was jointly organized by the Metropolitan and the National Museums of France and was shown in Paris at the Grand Palais. It contains tapestries borrowed from 39 museums, cathedrals and private collections in both North America and Europe, including four tapestries from the Hermitage in Leningrad. Among the masterpieces in the show are the six pieces of the *Lady with the Unicorn* series (opposite) from the Cluny Museum in Paris, which are being shown for the first—and perhaps the only—time with the famous *Hunt of the Unicorn* set belonging to the Cloisters, the medieval branch of the Metropolitan in upper Manhattan.

One of the finest tapestries ever executed is the *Narcissus*, owned by the Boston Museum of Fine Arts. Here in the center of a great field bestrewn with flowers and dotted with dainty little rabbits and other beasts, an elegantly dressed youth leans over the side of a fountain with graceful ease to admire his reflection in the water, while a handsome male pheasant does the same on the other side. An inscription on the young man's thigh informs us that this is the Narcissus of Greek myth, who died of chagrin at not being able to possess the beautiful being he saw in the water, and was changed into a flower. The languor of the pose, the ethereality of the atmosphere, the mixture of firmness and sweetness in the design, have led some critics to suspect that the artist was inspired by a contemporary Italian model, perhaps by Botticelli.

All flowers bloom at once

The *Narcissus* (next page) is an example of a tapestry known technically as *millefleurs* (literally, a thousand flowers), and the name is no exaggeration, for the backgrounds of the best of them are packed with an amazing profusion of precisely rendered plant life. Botanists have examined the vegetation which forms the background of the *Hunt of the Unicorn* series and have distinguished more than 100 different species, of which they have identified more than 80, all done with amazing accuracy and delicacy of touch.

The *millefleurs* (its heyday was about 1500, and no one knows for sure where or how it developed) is perhaps the purest type of tapestry. There is little or no attempt to suggest depth, which would be out of place in a tapestry anyway. A painting can be considered a window in the wall, but a tapestry hangs quite obviously in front of the wall and seems to call for a flat decorative treatment. At all events, the *millefleurs* generally eschews perspective; it strews its figures, human or animal, knights or rabbits, all over a vivid carpet of grass and flowers, and at its best creates a fairyland atmosphere of tender enchantment.

The wonderland tone of the scene is in part created

Robert Wernick, free-lance writer now based in Paris, contributes articles to many magazines, including the Atlantic *and* Holiday. *He has written two novels.*

Museum of Fine Arts, Boston

A young man in plumed headgear and a male pheasant admire their reflections in this detail of *Narcissus*. The densely patterned floral background epitomizes the style known as *millefleurs* (a thousand flowers).

by the fact that all those plants, which in real life bloom at different seasons of the year, are here all flowering together. For the lady well-read in the symbolic language of flowers, a highly developed art in the Middle Ages, every one of them had its tale to tell; some were doubly symbolic, like the cherry blossoms which signified both eternal life in heaven and erotic delights on earth. The violet stood for humility, the walnut for Christ, the seed-filled pomegranate for fertility, the forget-me-not for fidelity.

The *Hunt of the Unicorn* presently consists of six tapestries and two fragments of a seventh. The Cluny series, the *Lady with the Unicorn,* deals with the same beast, in much the same style but with a wholly different atmosphere. What little is known of the origins of these amazing works has aroused controversy. It is presumed that they were ordered for weddings, for one symbolic meaning of the unicorn hunt was the conquest of chastity by ardent and pure wooing. Obviously, they were made for weddings of very important people, but whose? The coats of arms which once formed the upper border of the *Hunt of the Unicorn,* and which would have made identification easy, were cut off during the French Revolution.

Unicorns' horns and the narwhal

The crescents on the banners in the *Lady with the Unicorn* series for a long time led writers like George Sand to believe that the tapestries were executed for a Turkish exile, Prince Zizim, smitten with a hopeless love for a Christian damsel. But recent research has thrown this romantic tale out the window by showing that the crescents form the heraldic device of the Le Viste family, rich magistrates from Lyons; the tapestries would then have been intended to adorn the marriage of one of their daughters.

There are no clues to the identity of the artist or artists responsible for either of these series. Whatever their sources, they form an extraordinary ensemble. In contrasting manners, they offer an unexampled insight into the ways of seeing and the ways of thinking that marked the end of the Middle Ages.

Both series deal with an animal which we know as mythical but which to the medieval mind was a very real creature. Did not wealthy kings and bishops own unicorns' horns, long, whorled and white, five feet and more in length, and were not these horns beyond price because of the way they changed color when brought into contact with poisoned food or drink? Sober modern science claims that these horns were in reality the overgrown canine teeth of the narwhal, a medium-sized whale of northern waters.

The unicorn illustrated in medieval bestiaries or animal encyclopedias is milky-white, the general size

The Cloisters, New York

The unicorn, having been brought to bay, deftly skewers a dog in this 12-by-13-foot tapestry from the superb, richly detailed *Hunt of the Unicorn* series, probably woven in Brussels around 1500.

and shape of a horse, but with cloven hoofs, a goat's beard and a single horn jutting out of its forehead. It was described as a beast of almost unimaginable wildness, which could only be captured by a pure virgin sitting in a forest clearing. If there was any stain in her, he would rip her open with his mighty horn. But attracted by the genuine *odor castitatis,* the odor of chastity, he would come and lay his head on her lap and suckle her breasts, whereupon he would sleep, and only then might he be taken.

Surrounding the animal was a cloud of symbolical meanings. The capture of the unicorn by the maiden was considered by some a reenactment in the mundane world of the miraculous incarnation of Christ in the womb of Mary. Many esoteric doctrines are associated with the unicorn, but what part they play in the tapestries is a matter of debate.

Of the two series, the one owned by the Cloisters is more representative of the medieval taste for lively, realistic detail. The brightly clad huntsmen go off as for any ordinary hunt. The tracking down of the unicorn, the fierce resistance of the beast, which is disemboweling one hound while another has fastened on its leg (above), the grim faces of the hunters, the

spears, the horns, all are woven in the easy familiarity of one who often must have seen the chivalry of France and Burgundy hunting down the stag or the boar.

The Cluny series illustrates another aspect of the medieval mind, its passion for recondite and often obscure symbolism. Five of these tapestries have been interpreted as allegorical representations of the five senses. In each, a demure and dignified young lady stands or sits between a lion and a unicorn, both of them remarkably gentle and obedient for beasts of such fabled ferocity. But the significance of their different relationships in the various scenes has yet to receive a satisfactory explanation. In *Taste, Smell* and *Hearing*, both animals are holding the banners of the Le Viste family. In *Sight* (p. 42), the lion alone holds the banner while the unicorn places his forepaws meekly in the maiden's lap, and looks at its own image in the mirror she is holding. In *Touch*, it is the lady herself who holds the banner while with her other hand she strokes the precious horn of the unicorn.

In a sixth tapestry, the lion and the unicorn are again holding the banners as they pull aside the richly decorated flaps of a blue tent bearing the inscription *A mon seul désir,* while the lady chooses jewels from a box held by her serving maid. There is nothing to explain the connection of this enchanting scene with the preceding ones.

The *Lady with the Unicorn* series is particularly rich in animal life, rendered with care and evident affection. The parakeet which is landing with upstretched wings on his mistress' wrist in *Taste,* the monkey that mimics her gestures in *Smell* and *Touch,* are two of the most attractive of the swarming world of *bestelettes*—little animals—which inhabit the *millefleurs:* rabbits, greyhounds, herons, pheasants, woodcocks, even predators like weasels, foxes, wolves, lions and hyenas, all gambol alike in the peaceable kingdom of these gardens.

One of the most exceptional tapestries in the show is that of the *Apocalypse,* owned by the museum of Angers in France, which is not only the most important surviving example of 14th-century tapestry (the

Tapestry Museum, Angers, France

This panel from the *Apocalypse,* woven in the 1370s, illustrates a text from the last book of the Bible in which the people of the world prostrate themselves before a blasphemous, all-powerful beast.

account books of Louis, Duke of Anjou, show that it was ordered and paid for in 1377-79), but also one of the largest (more than 500 square yards) of the great narrative tapestries of the golden age. It was designed, the account books show, by a Flemish painter named Jan van Brugge, Charles V's court painter, who was known to the French as Hennequin. Apparently Hennequin's tapestry design effected a revolution in the art of weaving.

Decorated wall-coverings had been known in Europe for centuries. Monks had woven scenes from the Gospels in their monasteries, and the ladies in waiting of Queen Matilda (as tradition would have it) had stitched out the story of the Norman Conquest of England in the famous Bayeux Tapestry (which technically is not a tapestry at all, but an embroidery, done with needles on a previously existing piece of linen rather than created on the loom) at the end of the 11th century. Hennequin's *Apocalypse,* however, outdid anything that had been seen before in scale, in the brillance of its colors, the skill of its rendition of movement and atmosphere, the sheer excitement of its story.

From his time on, tapestry was exploited as a story-telling device. Hung in the cavernous halls of castles which had to keep their windows narrow for defensive purposes, they lit up the gloom with their fresh colors, and kept the eye busy tracing out the development of fascinating tales for hours or days on end. On a rainy day—when there was no war on, no hunt or joust—they must have filled the function of the color television set today, offering a mixture of entertainment and instruction to the bored lords and ladies.

Hennequin's enormous work is based on three chapters of the last book of the New Testament, and translates the feverish visions of St. John into a series of scenes, arranged in two rows in successive panels like a modern comic strip. Originally, there may have been 98 panels, seven times fourteen, seven being a mystic number on which the *Apocalypse* constantly dwells. St. John himself, a bearded, dignified figure, stands on the sidelines in each of the panels. He observes and

Cleveland Museum of Art; purchase, Leonard C. Hanna jr. Bequest

Two children and a mallard frolic in a brook near the square-toed shoes of Time, an allegorical figure suggesting the fleeting quality of happiness, in this detail from an early 16th-century work.

The Louvre, gift of M. and Mme Grog-Carven

Common peasants, an uncommon subject for this aristocratic art form, take time out from a rabbit hunt to enjoy a robust *déjeuner* of bread, pears, tart and wine in *Peasants Picnicking* woven c. 1460.

records the rage in heaven and the calamities on earth that will accompany the last days before the Second Coming. St. Michael, at the head of the heavenly host, spears the Devil. The dragon with seven heads rises from the sea and passes its scepter to the beast with seven heads and ten horns. The people of the earth fall down and worship the beast (p. 46).

Hennequin's compositions were derived from those of earlier painters of miniatures, but he transformed them completely when adapting them to the larger space and freer forms made possible by the technique of weaving. The verve and vigor of his work made it immensely popular; it was widely imitated and gave the impetus to a great flood of masterworks from the looms of northern France and Flanders.

Why these regions in particular? Because at that time they were the richest in Europe, where the wool trade was laying the basis for a money economy which was to be the prototype of modern capitalism. The looms and the craftsmen were here, so were the banks providing the cash and credit to buy the silk and gold and silver that were woven into the wool, which was imported from England. Here, too, was a class of elegant aristocrats with a heady passion for the outward show of luxury.

John the Good, the weakest king France ever had, recklessly gave treasure and whole provinces away to his sons, the Duke of Anjou, the Duke of Berry and Philip the Bold, Duke of Burgundy, who by a judicious matrimonial policy acquired the immense riches and the wool-weaving industry of Flanders. All three sons were lavish patrons of the arts and vied with each other in ordering expensive tapestries. They tried to live in a constant round of feasts, festivals, tournaments and pageants. More than mere ostentation was involved in their purchase of tapestries, for it soon

became evident that these were a capital investment ranking with land and with gold.

The products of the looms of Paris, Arras, Tournai and Brussels achieved an international reputation. Great princes collected and stored them by the hundreds, and used them in their political and diplomatic transactions, to provide dowries for their daughters, to bribe the ministers of neighboring states or, on occasion, simply to dazzle the common people with evidence of their masters' magnificence. Philip the Bold, when he had to ransom his son, taken prisoner by the Turks during the last crusade in an incursion which ended in disaster at Nikopol on the Danube in 1396, found the most valuable objects he could offer were his Arras tapestries which outshone all the Oriental rugs in the palace of the sultan Bayazid I.

The Passion replaces battle scenes

If they collected tapestries for their monetary value, the princes of the time also loved them for their visual splendor. It was an age of violent contrasts of luxury and misery, and rarely have the fortunate few flaunted their riches so openly and on such a scale in the face of the poor. The surfaces of life counted for much more than they do now: A man's rank and importance had to be constantly demonstrated to the world by outward signs, and few signs were more impressive than hundreds of square yards of brilliantly colored cloth on the walls.

The noble collectors of tapestries were always on the move, for they had to keep their presence alive to their subjects. As they traveled from castle to castle, they took their tapestries with them to add some comfort and decoration to each succeeding set of bare, damp walls. They even took them along when they went to war, to line their tents. And they needed a variety of types, to suit different occasions. When John of Gaunt, Duke of Lancaster, came over to France in 1384 to negotiate an armistice, the Duke of Berry had the walls of the chapel where the meeting was to take place decorated with tapestries representing battles of antiquity. But John, on entering the chapel, exclaimed that those who aspire to peace ought not have scenes of combat and destruction before their eyes. So the duke sent the battles back and brought out another set representing the Passion of Christ.

From first to last, tapestry belonged to the kings and dukes, the rich and the powerful. All the works in this exhibition show both the virtues and the limitations of aristocratic art. It is bright, delicate, elegant, vivacious—an infinite delight to the eye. Its view of life is incurably lighthearted, sometimes superficial and frivolous. There are details of reality marvelously rendered with the quick instinctive-looking naturalism of primitive paintings. But the world as a whole is portrayed as a dreamworld of pleasure and repose, an enchanted garden quite outside the hurly-burly and the passions of daily life. No one would ever guess from the tapestries that these were centuries of fearful upheaval and conflict, the Hundred Years War, the Black Death, the breakdown of the old feudal order and the chaotic beginnings of the modern nation-states. Even when they portray grim subjects, they infuse them with a kind of golden haze. The battle scenes look like tournaments, the hunting scenes like pageants. Fierce beasts like lions and leopards loll around with mild wistful looks on their faces. Time comes to a stop in these tapestries—and that, of course, is one of the secrets of their perennial charm.

Most of the subjects were taken by the painters and master weavers from the great repertory of themes and subjects which pleased the cultivated readers of the Middle Ages. The subjects might be drawn from ancient history, such as the tapestry showing Nero sending Vespasian and Titus off to Judea (pp. 52-53), or they might come from contemporary epic poems like the *Geste de Jourdain de Blaye,* a bloodthirsty tale of treachery and revenge.

There are representations of allegorical figures, like the female Astronomy (pp. 50-51) and of famous historical or pseudo-historical characters, like *Les Neuf Preux,* the model warriors known as the Nine Heroes

The Cloisters, New York

This 14th-century portrait of King Arthur (shown in a detail) was commissioned by the Duke of Berry.

Röhsska Museum for Arts and Crafts, Gothenburg, Sweden

Lady Astronomy herself, identified by the scroll she holds, points out the moon, stars and perhaps a few comets to a man whom some identify as the

15th-century German astronomer and mathematician, Regiomontanus. A seated assistant with an astrolabe marks down the observations in a book.

or the Nine Worthies, among whom the bearded face of King Arthur (p. 49) is especially striking.

The exhibition also contains joyous scenes, filled with the famous Flemish gusto, of peasants taking time off from a rabbit hunt to fill their bellies with food and wine (p. 48); of resplendent gypsies passing by a castle and telling the lady's fortune in her palm; of wine-growers pouring their product into barrels.

And there are more sober, courtly scenes: of a richly dressed couple seated side by side, the husband stirring up a basin of water to encourage the newly captured bird on his lady's wrist to bathe; of a gentleman presenting a heron to a lady; of a concert with lute, small organ and viol around a fountain.

There are ecclesiastical subjects, too, sometimes for tapestries intended to hang in churches, but also to give illustrated lectures on piety in private homes. Such is the splendid series, *The Legend of Our Lady of Sablon*, now scattered in museums from Leningrad to Glasgow, recounting the miraculous appearance of the Virgin to a devout spinster in Brussels, and how she succeeded in getting a wonder-working statue moved from Antwerp to her own city. Despite the solemnity of subjects like this, the emphasis is far more on the sensuous softness of the materials than on holiness or grim austerity.

The stern and smiling faces of Time

For all their brightness, many of these tapestries are permeated with a certain melancholy. The dapper lords and dainty ladies who spread them on their walls were all too aware that at any moment everything they owned, and their very lives, might be swept away by war or pestilence. It was what made them hang on all the more firmly to the joys of material possession. A Brussels tapestry of the 16th century, in the Cleveland Museum of Art, describes the two faces of Time, a male figure who stands in the center, smiling on a party of richly clad young people disporting themselves in a pretty garden, while children play in a brook (p. 47); on the right side the figure of Time sternly cudgels an old man in a barren landscape, capped by ruins, under the eye of a soberly dressed woman with a cane.

Time was to take its toll of the great tapestries as well. The beginning of their decline can be dated to the year 1476, when the painters of Brussels brought suit against the master weavers. The two had worked together in close cooperation in the past. The painters made the designs ("cartoons") which the weaver followed, but the weavers had considerable leeway in varying the shapes and colors as they worked. And this was as it should be, for the people with the threads between their hands were the best to judge the precise

effects that could be achieved with the weaving technique. But the painters were beginning to rise in their own estimation, and they complained that their beautiful compositions were being mangled by ignorant mechanics. They won their lawsuit, and from that day forward tapestry-making began to lose much of its originality and force.

The painters were able to achieve spectacular technical feats in enriching their colors and in creating the illusion of perspective. But they could not disguise the fact that tapestry-weaving was no longer an independent art but a more or less effective means of reproduction. Great workshops like those of Brussels and royal factories such as the Gobelins in Paris continued to pour out large numbers of tapestries which were more to the taste of wealthy patrons than the old ones, now judged to be crude and ill-proportioned.

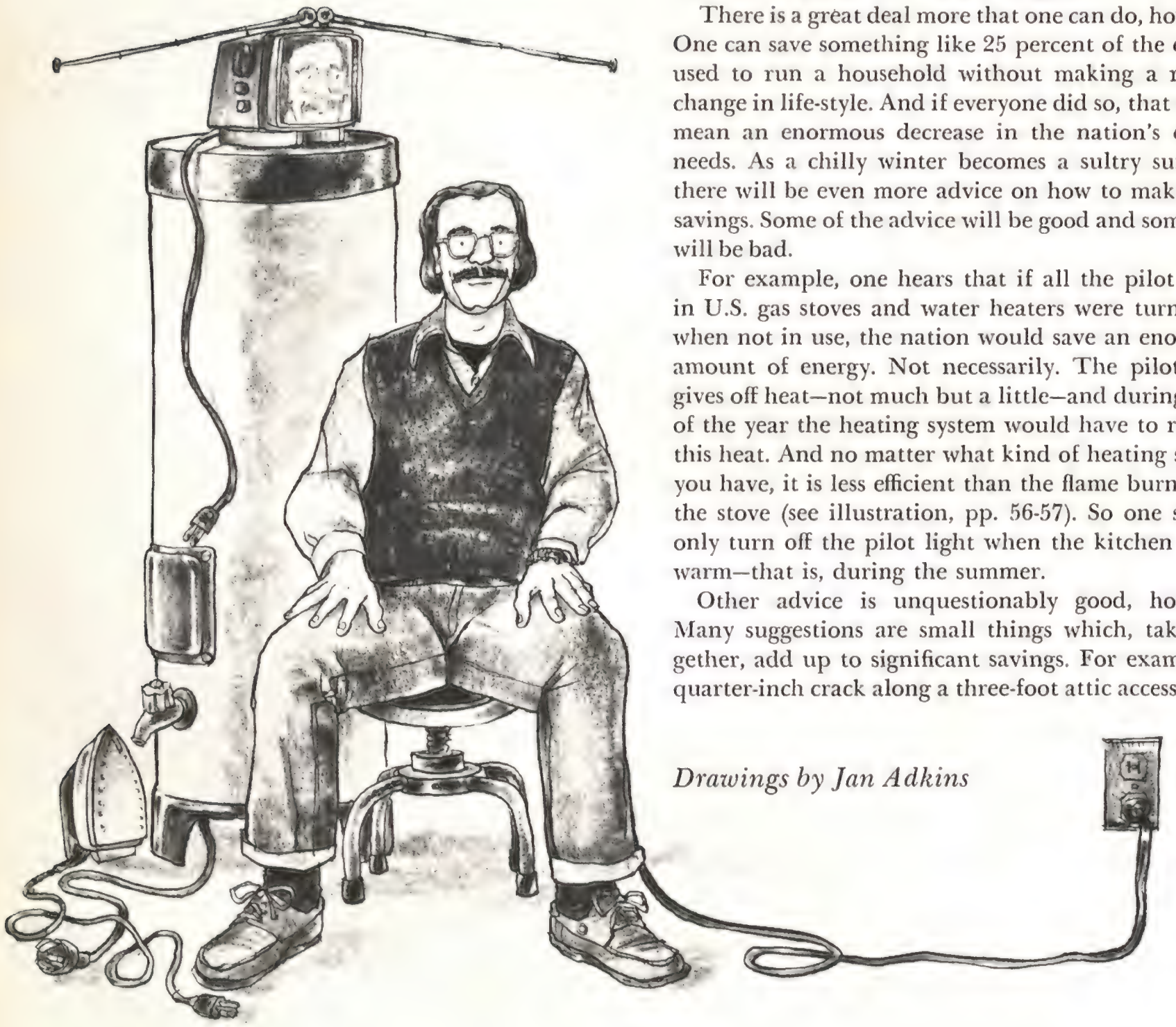
The tapestries themselves suffered the outrages that time reserves for fragile works of art. In the lifetime of the original owners they were often exposed to the deadly effects of sun and rain to show off the glory of their houses at events like marriages or coronations. Stored away in attics or cellars, they were prey to moth and mildew, their colors faded, their gold and silver threads tarnished. But people knew that the gold and silver were there and often plundered them. One day in 1797 the French government ordered hundreds of tapestries which had belonged to the kings of France to be burned in order to recover the precious metal. By the 19th century, tapestry was an all-but-forgotten art, so woefully neglected that many of the most valuable old masterpieces were used as rugs in provincial government offices.

Only in the last generation or so has the picture changed. Painters like the late Jean Lurçat helped revive the art of tapestry-weaving, and today weaving of all sorts has become something of a fad among young people. Since World War II, tapestry exhibitions have stirred public interest, and increasing throngs have been able to enjoy the art of the loom.

Now, at last, the anonymous weavers of the Franco-Burgundian courts have been admitted to the place they deserve in the pantheon of great artists.

Vespasian and his son Titus each appear twice in this scene, one of a set of tapestries called *The Vengeance of Our Lord*, which was probably made in Tournai about 1475. On the left, the two warriors kneel before Nero, who is incongruously garbed as a medieval potentate. He commands them to pacify Judea. In the right foreground, Vespasian prepares to mount his horse; above him Titus (in profile) joins his troops on the ship.

How to cut fat out of your home energy budget



If you are a regulation-size adult you give off about the same amount of heat as a 100-watt light bulb. It takes about 675 pounds of coal to fuel the bulb if left on all year and it takes about 1,400 pounds of food to fuel you for a year (*you* can't run on electricity, as our hopeful homeowner is trying to do, below, left).

Of course the comparison is invidious: Your main function, like that of the bulb, is not to produce heat. But the waste heat is not incidental in either case. It is an absolute necessity, thanks to the laws of thermodynamics. If you take fuel of any sort and make power from it of any sort, you have to waste energy along the way. The question is how much is wasted and how much has to be wasted.

Take the American home. The 70 million living units of the United States account for one-fifth of all the energy used in the nation (not counting the energy used to build the houses and make the appliances). In response to pleas from the government and other organizations, most of us have turned down the heat in our houses and turned off a few lights.

There is a great deal more that one can do, however. One can save something like 25 percent of the energy used to run a household without making a radical change in life-style. And if everyone did so, that would mean an enormous decrease in the nation's energy needs. As a chilly winter becomes a sultry summer, there will be even more advice on how to make such savings. Some of the advice will be good and some of it will be bad.

For example, one hears that if all the pilot lights in U.S. gas stoves and water heaters were turned off when not in use, the nation would save an enormous amount of energy. Not necessarily. The pilot light gives off heat—not much but a little—and during most of the year the heating system would have to replace this heat. And no matter what kind of heating system you have, it is less efficient than the flame burning in the stove (see illustration, pp. 56-57). So one should only turn off the pilot light when the kitchen is too warm—that is, during the summer.

Other advice is unquestionably good, however. Many suggestions are small things which, taken together, add up to significant savings. For example, a quarter-inch crack along a three-foot attic access hatch

Drawings by Jan Adkins

will cost you more than 20 gallons of fuel oil a winter in a moderate climate, even more in a severe one. The rule of thumb is that for an inside-outside temperature difference of 35 degrees, your home loses 55 BTUs per hour through every square inch of such openings. The idea is to learn to see those BTUs disappearing.

Think of it as a game—the game of household thermodynamics. It is a game anyone can play and one that everyone will *have* to play. The trick is to see the energy that flows all around us, just as a photographer or an artist sees light spilling over a building or bouncing off a wall. If we learn to make choices in terms of energy consumption as we now do in terms of money, we will have stretched the finite energy resources of the planet—and we will save ourselves a good deal of cash in the bargain.

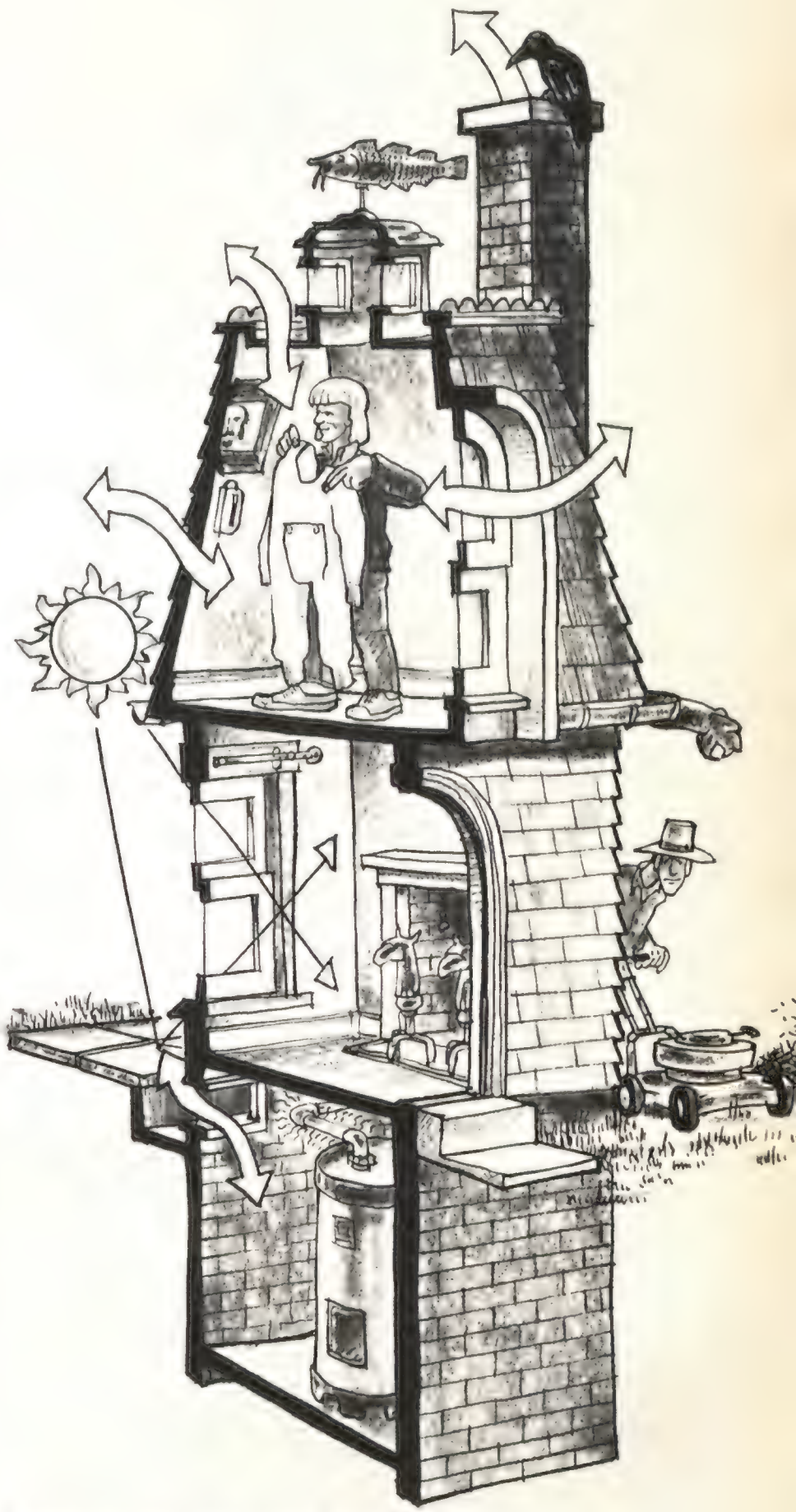
The language of energy

The language of energy is filled with words we have heard all our lives, but don't always fully understand. We buy light bulbs rated in watts, cars rated in horsepower, food rated in calories and air conditioners rated in BTUs. All these units are different ways of saying the same thing, and all can be converted and compared. Here's how:

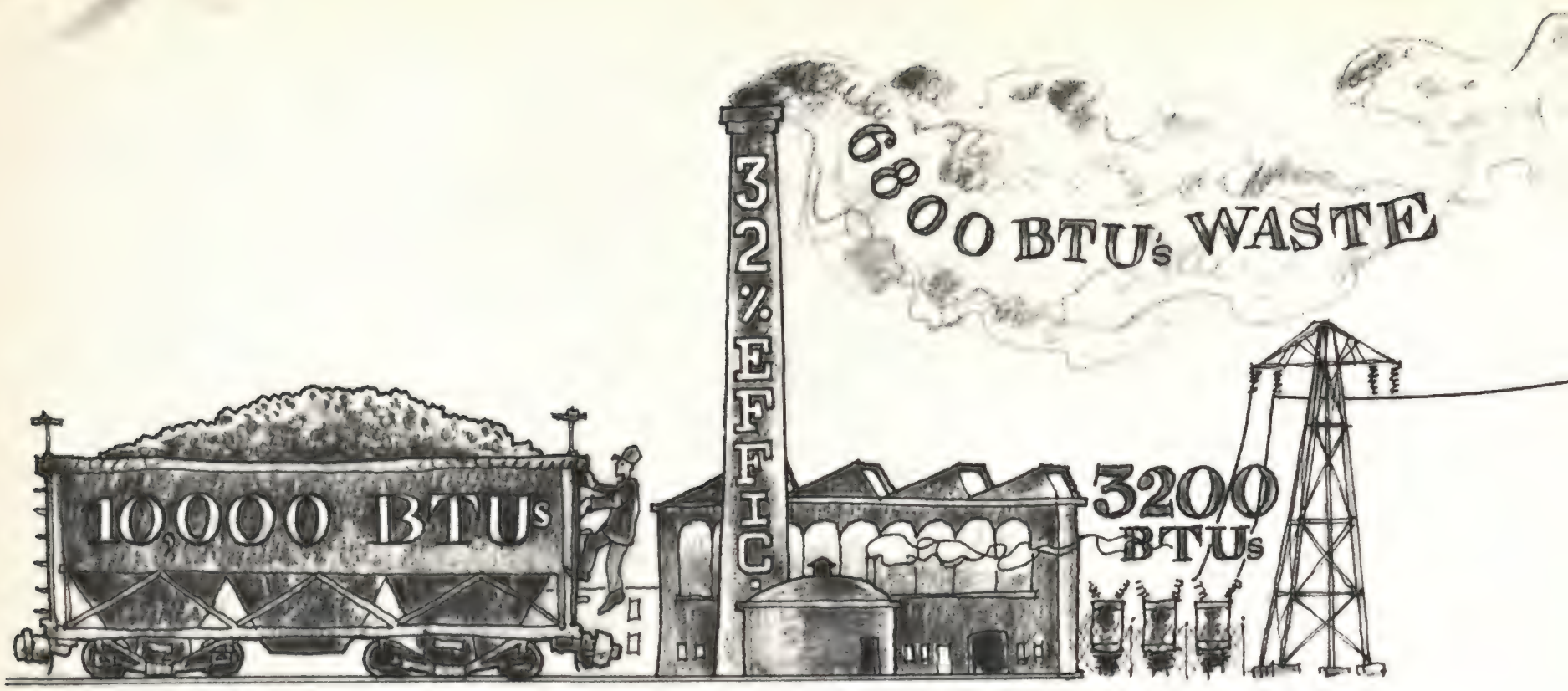
- One BTU (British thermal unit) is equal to the amount of heat needed to raise the temperature of a pound of water by one degree Fahrenheit. Another way to think of a BTU is that it is about one-fourth of a dieter's calorie (the "large" or kilocalorie). In terms of fuel sources there are 5,000 BTUs in a pound of wood, 1,000 in a cubic foot of natural gas, 13,000 in a pound of coal and 125,000 in a gallon of gasoline.
- An advantage of thinking in BTUs is that they are readily convertible to other units. For example, 3.4 BTUs equals one watt-hour, a power of one watt for one hour. This is perfect conversion, which is only theoretical. In practice, it takes about ten BTUs at a power plant to produce one watt-hour.
- A kilowatt is equal to 1,000 watts, or about one-and-a-third horsepower, and a kilowatt hour is 1,000 watts of power expended for an hour (ten 100-watt bulbs burning for an hour). This is the unit used on your electric bill.

Knowing these conversions, one can calculate how much energy and fuel are used by appliances. Suppose an electric dryer takes 4,000 watts and it runs for 45 minutes to dry a load of wash. The 45 minutes is three-quarters of an hour. So take three-quarters of 4,000 watts to get the watt hours, 3,000, or three kilowatt hours. From the conversions above it is shown that it takes about 10,000 BTUs to produce a kilowatt hour, so it will take about 30,000 BTUs to produce the power needed to run the dryer once. This, in turn, converts

By raising your energy consciousness, you can cut your household consumption by 25 percent and save money, too



Learn to "see" the silent flow of energy through your home, and you will be able to trace it from where it comes in to where it goes out, and determine whether it was well used or wasted.



to more than one-fourth of a gallon of gasoline or nearly two-and-a-half pounds of coal.

How many watts does an appliance use? If it does not appear in the table of appliances on p. 58, you can find out by multiplying the voltage of the house current (*e.g.*, 120) by the amperes (the measure of current consumed by the appliance usually found near the serial number). For example, the small electric motor on a rock tumbler is rated at 0.40 amps. Multiplying this by the house voltage gives 48 watts, which is in the range of a light bulb. If the motor is run 24 hours, it uses 1,152 watt-hours. Rounding it off to one kilowatt, the motor used 10,000 BTUs, or not quite a twelfth of a gallon of gasoline, two pounds of wood or less than a pound of coal.

Appliances

Have you ever tried to count the appliances in your house? To do so is something of a shock for anyone who has grown up believing in the tradition of American self-reliance. On p. 58 is a list of typical appliances found in most homes and their energy use. Armed with the conversions previously mentioned, you can make your own list and calculate the total energy used in a week, say, by all of the machines in your house. And then you can compute fairly precisely how much energy you could save by being more selective in their use. For example, dishes dry perfectly well at room temperature, so why put a dishwasher through its drying cycle?

Even more significant savings can be made if you are about to replace an appliance with a new one. Often the higher priced machine is less expensive in the long run because it is cheaper to run. A Harvard study compared two refrigerators of similar size. One cost $292 to buy but would cost $746 to operate over its 20-year lifetime. The other cost $359 to buy but only $392 to operate over 20 years. Thus the expensive one is $287 cheaper to own. The same principle applies to virtually every appliance.

The greatest savings, of course, lie in doing without wherever possible. It takes energy to make an appliance and transport, as well as use, it. It even requires energy to take it to the dump.

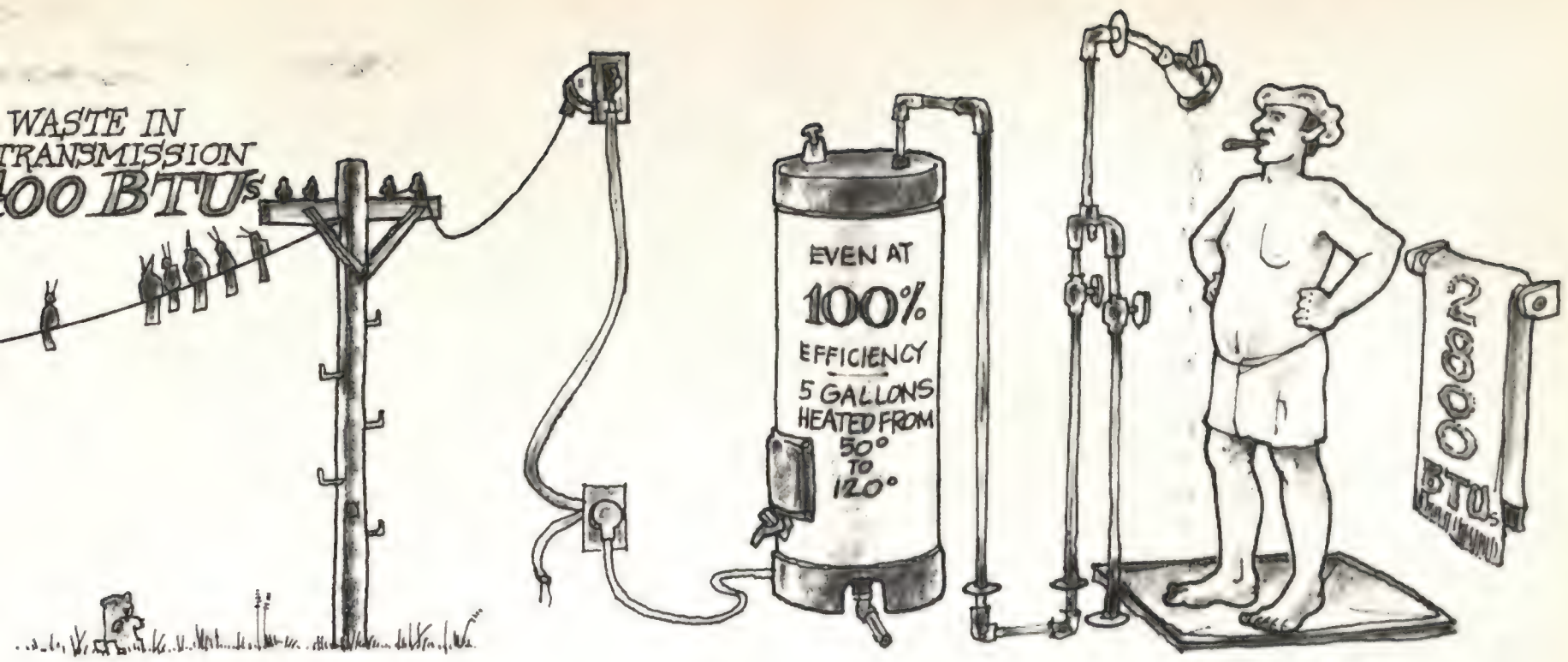
Heating

Outside of fueling the family car, most Americans spend more energy to heat their homes than for any other single purpose. Residential heating takes something like 11 percent of the national energy budget, and a much bigger bite out of the family energy budget—up to 40 percent in northern parts of the country—not to mention an increasingly larger bite out of the family money budget as well.

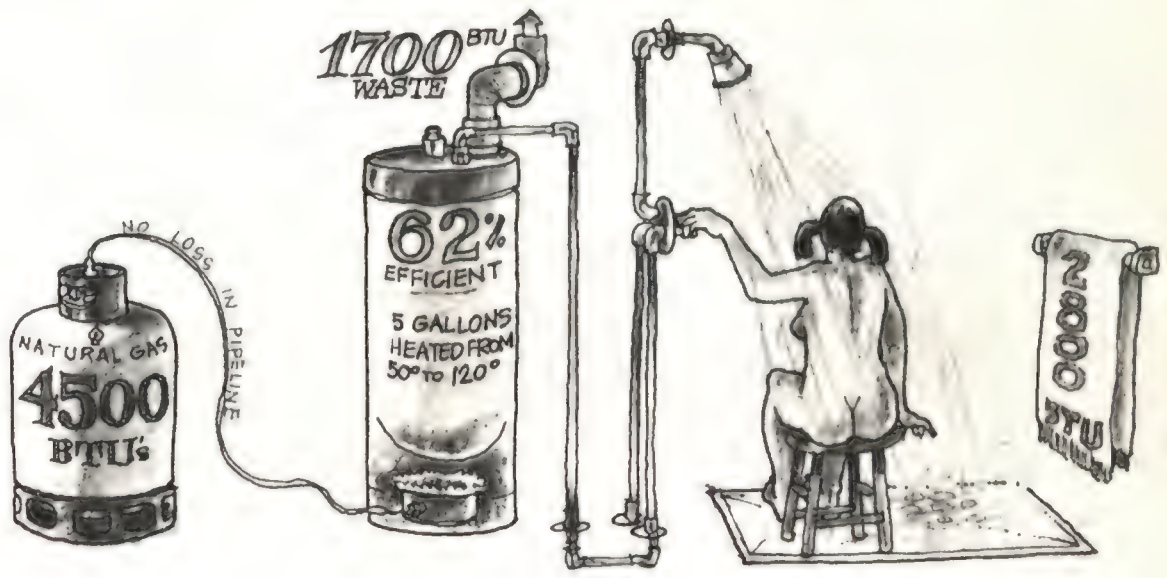
A home loses heat in three ways, and all can be managed so we get the most for the least. Home heating plants are relatively efficient, some as much as 75 percent. That still means a lot of waste heat goes up the chimney and some of that can be tapped, for example by attaching fins to the flue pipe, whose outside temperature may reach several hundred degrees (see illustration p. 64). The fins would have to be removed in summer if the burner also heats your water. Those building a new house can go a step further by having heat exchangers installed right in the chimney.

Of the heat that reaches the radiators, about two-thirds is eventually lost to the outside while the remaining third is lost in heating cold air that infiltrates from the outside.

There are at least four ways that you can reduce



To end up with 2,800 BTUs in hot water for your shower, you can use several methods. With electric heat, above, you have to start with 10,000.



Heating with gas (right) you need start with only 4,500 to obtain precisely the same amount of hot water. Such differences can add up quickly.

the amount of energy you now use to heat your home:

• Reduce the amount of heat you require. Lowering the temperature six degrees can save you approximately 20 percent of your fuel bill in cities like New York, Washington, St. Louis, Wichita, Denver, Boise or Walla Walla. (The figure will be lower for areas colder than these, and higher for warmer areas.) Raising the humidity will make a lower temperature a good deal more tolerable.

• Make sure your heating plant is working at top efficiency. In an oil-fired system, for example, not only should the burner be serviced, but the boiler should be vacuumed. A quarter-inch layer of carbon inside combustion chambers can reduce efficiency by as much as 20 percent. In any home, the heating system should be balanced so that it does not work overtime to keep one room warm while others are too warm.

• Keep the heat in the house as long as you can. Heat is continually being lost through walls, windows, ceilings and the roof. Insulation and storm windows significantly cut this loss, and quickly pay for themselves (see the section on insulation, p. 58). Evergreen trees planted to form a windbreak slow the rate at which winter winds suck heat from your house.

• Reduce the amount of cold outside air that gets in and must be heated. Caulking and weatherstripping around doors and windows can eliminate a lot of infiltration. Check for leaks around air conditioners and pull-down attic doors and seal them. If vapor forms on the inside of windows on the downwind side of your house on cold days, you know the house is properly sealed and that you have provided the highest feasible humidity for maximum comfort.

Another important part of the heating bill is for hot water. About three percent of the nation's energy is used to heat water in homes. Here, too, there are a number of things you can do:

• Make sure your water heater is working efficiently.

• In many homes, you can adjust the temperature of the hot water. Turn this down 10 or 20 degrees.

• Make sure hot water pipes are insulated, particularly when they run long distances.

• Use cold water whenever possible for washing clothes, etc.
• In a new home it may be possible to arrange the drains so that they heat incoming water. Also, if you are designing a new house, look into such equipment as solar water heaters (see p. 64).

Insulation

Insulation and storm windows slow the flow of heat out of your home. The difference between inadequate and proper insulation in a temperate climate can easily be 40 percent of your fuel bill. And insulation has the additional advantage that it can make you feel comfortable at a lower temperature than would otherwise be the case.

The human body loses heat by conduction (through clothes), convection (by air currents moving past the skin), evaporation of moisture from the skin, and radiation. (The body also loses heat by respiration and evacuation, but these are relatively insignificant.)

Drafts make us feel cold, because they increase the rate at which we lose heat by convection. And low humidity inside a house in winter makes us feel cold, because it increases the rate at which perspiration evaporates. Moving air also increases this rate.

Perhaps least familiar is how we lose heat by radiation. When walls, ceilings and floors are cooler than 80 degrees (the average surface temperature of a normally clothed adult), we lose heat by radiation of heat directly to these surfaces, regardless of the temperature of the intervening air. If we feel comfortable at 71 degrees in a room with one outside wall, we need an air temperature of 73 degrees to feel equally comfortable in a room with two outside walls.

Insulation behind walls, ceilings and floors means their inside temperatures are warmer; storm windows

Typical home appliances

	average wattage	*est. kwh consumed annually*
Air cleaner	50	216
Air conditioner (room)	860	860
Blender	386	15
Broiler	1,436	100
Clock	2	17
Clothes dryer	4,856	993
Coffee maker	894	106
Deep fryer	1,448	83
Dishwasher	1,201	363
Electric blanket	177	147
Floor polisher	305	15
Freezer (15 cu. ft.)	341	1,195
Freezer (frostless 15 cu. ft.)	440	1,761
Frying pan	1,196	186
Hair dryer	381	14
Heater (portable)	1,322	176
Heating pad	65	10
Hot plate	1,257	90
Humidifier	177	163
Iron (hand)	1,008	144
Microwave oven	1,450	190
Range		
(oven)	12,200	1,175
(self-cleaning oven)	12,200	1,205
Refrigerator (12 cu. ft.)	241	728
(frostless, 12 cu. ft.)	321	1,217
Refrigerator/freezer		
(14 cu. ft.)	326	1,137
(frostless)	615	1,829
Sewing machine	75	11
Television		
black & white		
(tube type)	160	350
(solid state)	55	120
color		
(tube type)	300	660
(solid state)	200	440
Toaster	1,146	39
Toaster oven	1,333	205
Toothbrush	7	0.5
Trash compactor	400	50
Vacuum cleaner	630	46
Washing machine		
(automatic)	512	103
(nonautomatic)	286	76
Waste disposer	445	30
Water heater	2,475	4,219
(quick-recovery)	4,474	4,811

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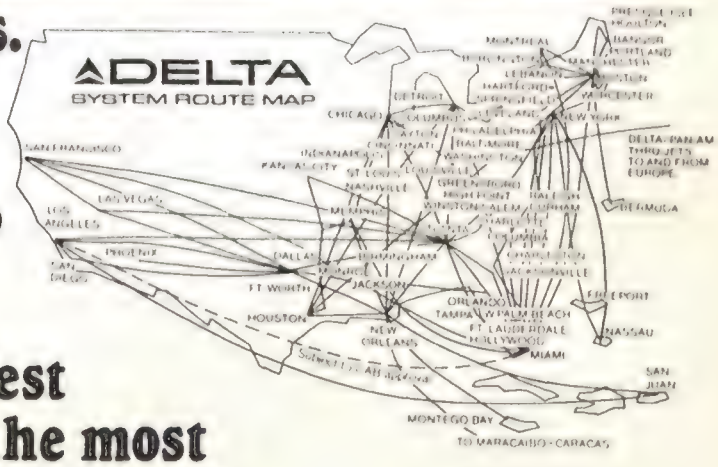


Delta's Wide-Ride™ TriStar gives "comfort" a whole new meaning. Now Delta has the 747, the 727, the DC-10 and the TriStar in its Wide-Ride fleet.

or double panes do the same for windows. Thus they make lower temperatures tolerable.

The secret of insulating materials is the entrapment of tiny air spaces. In large air spaces, heat is readily transferred by convection, but in tiny spaces, air is a very good insulator. A dense material, such as brick, with little or no air space, will conduct five BTUs per hour through a one-inch thickness for every degree of temperature difference between one side and the other. Wood, with more air spaces, will conduct only one BTU in an hour. A mineral-wool blanket will conduct only three-tenths of a BTU in the same time. And insulation is not limited to one inch, of course. The optimal amount is generally considered to be three inches in the walls and at least six inches between attic floor joists. In addition, reflective foil will bounce the heat being lost in radiation to where you want it.

Storm windows also create an air space, of course, large but still useful. There is some convection in the space between inside and outside windows, but nothing like the convection of winter winds. Storm windows cut in half the heat loss through windows, and they cut in half the difference between air temperature in the room and the window temperature.

Cooling

A look at the list of appliances on p. 58 shows that keeping a house cool by running air conditioners is the hard way in terms of energy. There are plenty of things that can and should be done first.

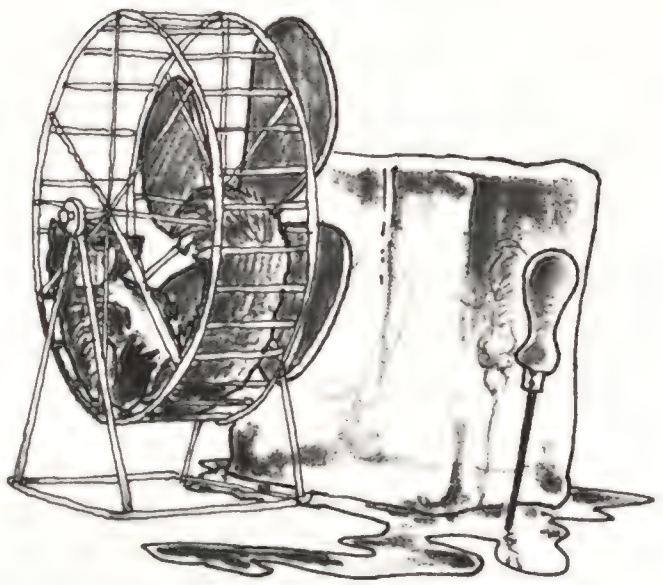
Insulation keeps heat in during winter and out during summer; it is therefore the first order of business (see p. 58).

Hot air rises and the sun burns down on your roof. Your attic temperature can be 40 degrees hotter than the rest of your house, burdening the entire cooling system. Simple ventilation of the attic will help; an inexpensive attic fan will do much more. It will keep the attic at about the same as the outside temperature during the day, and quickly circulate cooler night air through the house. Most days, in most parts of the country, that is enough to keep things reasonably cool. It takes about 300 kwh annually to run an attic fan; a central cooling system in a 1,500-square-foot house may take nearly 4,000 kwh.

- Windows are often kept shut tight even when the wind is blowing. Wind-tunnel tests show that if you open the windows on the windward side of the house a few inches and those on the leeward side more so, you get better ventilation.

On the other hand, you want to keep the sun out. Light colored shades or draperies will cut the solar energy inflow (dark ones simply absorb more). Better yet, put awnings on the south side of the house. Then you can open the shaded windows.

- Plant deciduous trees around the southern portion of the house. In summer they give shade, in winter they let the sun stream in through the windows.
- The difference in ground-level temperature between grass and concrete or flagstone around a house may be as much as 40 to 50 degrees. Plants respire water and its evaporation has a cooling effect. Do not, therefore, build a sunlit patio next to the house. Bushes, which are taller, have more leaf area and respire yet more water, provide a greater cooling effect.



There's more than one way to cool off.

Buying an air conditioner (if you insist)

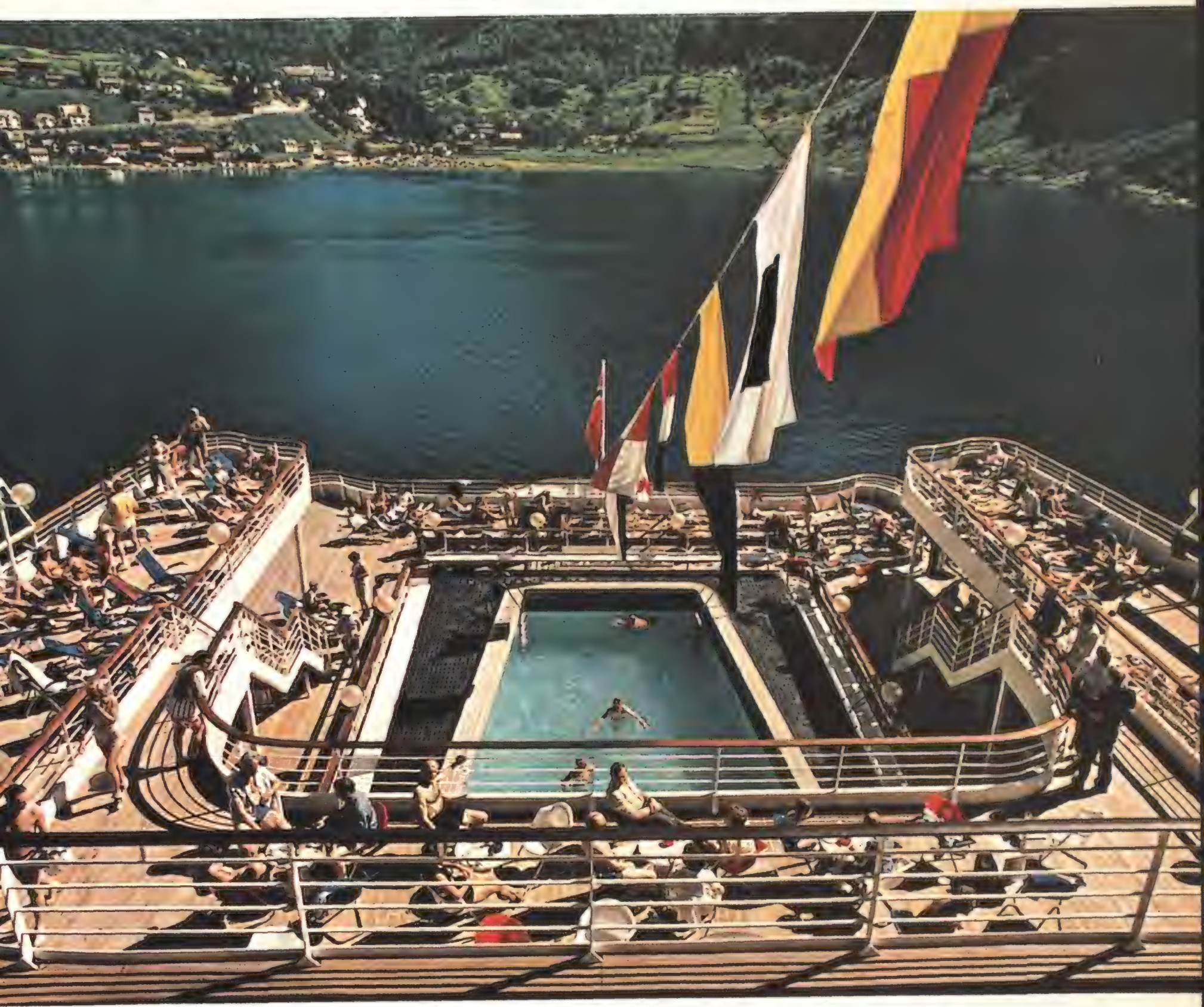
Many brands of air conditioners now come with a number called the energy efficiency ratio (EER). The

Next January, see the world from your patio.

See four continents, two sub-continents, and ten islands. See Bali and Bombay, Cape Town and Colombo, Rio and Rarotonga. See the Panama Canal, Milford Sound, and the Great Barrier Reef. All on the maiden World Cruise of the *Royal Viking Sea*, sailing round-trip from Ft. Lauderdale January 10, 1975, to circle the globe westbound via the South Seas in 94 days. (New Orleans boarding is also available.)

In your patio, you'll have a heated pool, a place in the sun, and refreshments at your fingertips. The all new, all first class *Royal Viking Sea*—of Norwegian registry, and spirit—is built for cruising. She could carry more than 500 passengers. But won't. So every one she carries has a little more space, a little more comfort. There's single seating in the dining room—and a horizon-to-horizon view. And 94% of all passengers have outside staterooms. The crew? Very Norwegian in attending the ship, very Continental in attending you.

If you can't take the full 94-day cruise, you can take part. Fly one way, sail the other. For example: Ft. Lauderdale-Auckland, 32 days. Durban-Ft. Lauderdale, 32 days. Fares begin at approximately $73 per adult per day in an outside double stateroom. For information and reservations call your travel agent. Or us: 800-227-4246 toll free. (N. Cal. & Can., 415-398-8000 collect; S. Cal., 213-627-1365 collect). *For a 92-page full color brochure on all our worldwide cruises, write Royal Viking Line, Dept. E-82, One Embarcadero Center, San Francisco 94111.*



ROYAL VIKING LINE 3 AROUND THE WORLD CRUISE

Energy conservation begins at home

EER is derived by dividing the number of BTUs of cooling capacity by the unit's wattage, and you can do it yourself if the dealer doesn't have the number available. A 10,000 BTU unit that draws 1,000 watts would have an EER of 10, which is good. If it draws 2,000 watts, the EER is 5 and that is terrible.

Generally, the higher EER, the higher the initial purchase price, but the savings on the electric bill can be as much as $18 a year, which is enough to pay you back in three or four years.

How many BTUs? Most dealers have charts to estimate the load you will need. (Or you can write the Association for Home Appliance Manufacturers at 20 North Wacker Drive, Chicago, Illinois 60606, and ask for their detailed information on the subject.) Given the choice, *buy an undersized unit rather than an oversized one.* If you need 9,000 BTUs, it is better to buy an 8,000 unit rather than a 10,000 unit. An oversized unit will cool the room so quickly that the compressor turns off too frequently, thus eliminating an air conditioner's second function: dehumidifying the air.

Maybe you don't need another air conditioner. If you have hot-air heat, you can run the furnace fan and circulate cool air from two or three units throughout the house.

The lawn as energy sink

To grow grass is to engage in a vast struggle against nature. It is fine in damp England, but grass was simply not supposed to grow in many parts of the United States.

Except for the cooling effect of grass as opposed to concrete, a lawn is a classic model of the negative energy system. It takes 162,000 BTUs worth of natural gas to produce the nitrogen in a 50-pound bag of fertilizer. A 10,000 square-foot lawn requires as much as five bags a season. It then takes about half a million or more BTUs worth of gasoline to mow that much lawn, and the only product of all this energy input—the grass clippings—is usually thrown away instead of being put to use.

As food shortages continue and prices climb, more Americans will learn to see a vegetable garden as a far more attractive bit of landscaping than grass. Also the garden's taller plants cool things off better and one doesn't throw away its products. Further, the garden provides a need for the grass clippings from whatever lawn area *is* retained: Grass clippings placed between rows of vegetables keep weeds down and fertilize the soil. They contain the same amount of nitrogen that you are paying cash for in 50-pound bags.

While you're at it, save the leaves in the fall instead of having them hauled away. With leaves, grass clippings, eggshells, vegetable waste and a little dirt you can start a compost pile which will give you a supply of beautiful humus for the garden.

In the real world, some energy is always lost.

Inching toward autonomy

Anyone contemplating building a new house is in the catbird seat in terms of energy. Proper insulation, roof overhangs and a host of other well-known but little-used principles can be specified (SMITHSONIAN, October 1973). Find an architect who understands how to design a house that works with, rather than fights against, the climate. Better yet, wait a year or two and see what happens with the many experimental houses now being built in various parts of the country—houses that

Imagine a land where you can inhale the perfume of pine beside a roaring waterfall.

Cup your hands and drink deeply from a crystal-clear creek. Discover the strange mystery of mist-shrouded Forbidden Plateau. Imagine a land where you can breathe the incense of salt, cedar and seaweed on a forgotten stretch of beach.

Imagine a land where you can stroll through an English city where flowers bloom the year round. Experience a metropolis on a harbour rimmed by towering mountains you can hike on in Summer and ski down in Winter, a metropolis where you can walk in a thousand acre park just minutes from elegant hotels.

Drive through orchards that are frothy white in Spring and crimson red in Fall. Savor the Summer taste of cherry cider from a roadside fruit stand. Take in a rodeo. Discover a ghost town.

Imagine a land of seacoast. Mountains. Lakes. Rivers. Rangeland. Desert. Wheatfields.

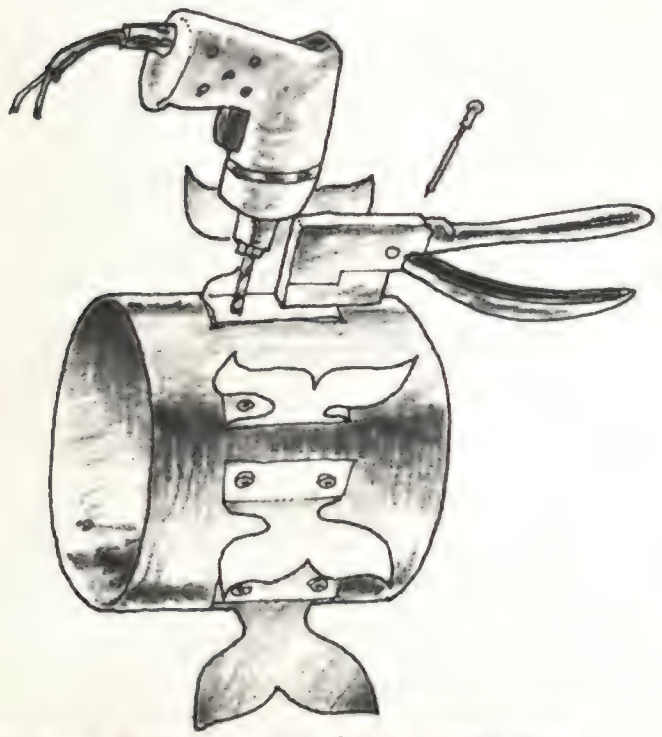
Imagine a vacation you'll return from with a thousand faces indeliby impressed on your mind and in your memory.

This is British Columbia, Canada.

After visiting British Columbia, stop off at the B.C. Pavilion at the Spokane World's Fair. See your travel agent for information on all-inclusive package tours or write the Department of Travel Industry, 1019 Wharf Street, Victoria, B.C., Canada, V8W 2Z2.

will employ the energy of the sun directly and test techniques for recycling household wastes and reclaiming energy.

Meanwhile, such equipment as solar hot-water heaters and wind generating plants is already available commercially and some of this can be fitted onto existing houses. It is worth exploring. Below are some sources of information. Imagine being the first person on your block to run the refrigerator with a windmill! (If you write these sources, be patient. Interest is growing rapidly and there may be a backlog of inquiries.)


Unlike cars, flue pipes put fins to good use.

• *Solar power* (SMITHSONIAN, November 1971). Information on Beasley Solapak water heaters can be obtained from *Solar Energy Digest,* P.O. Box 17776, San Diego, California. These are of Australian manufacture and are being tested here in the United States this spring.

For similar devices, as well as solar space heating and cooling modules and designs, write Mr. Everett Barber, Sunworks, Inc., 669 Boston Post Road, Guilford, Connecticut 06437.

A book entitled *Solar House Plans* by Harry Thomason is available (for $10) from Edmund Scientific Co., 555 Edscorp Building, Barrington, New Jersey 08007.

You can even find out about a solar mobile home by writing to Fred Rice Productions, Inc., 6313 Peach Avenue, Van Nuys, California 91401.

• *Wind power.* Information on a variety of wind generators and their use (see SMITHSONIAN, November 1973) can be obtained from the following sources:

Windworks, Route 3, Mukwonago, Wisconsin 53149.

Solar Wind Company, East Holden, Maine 04429.

Real Gas and Electric Company, Main and Armstrong Streets, Guerneville, California 95446.

Brace Research Institute, McGill University, Montreal, Quebec, Canada.

• *Hydroelectric power.* If you have a stream running through your property, you might want to install a small water-powered turbine to produce electricity. James Leffel & Co. of Springfield, Ohio 45501, is probably the only U.S. manufacturer of such equipment—ranging from 3 to 99 horsepower—and their Pamphlet A, called *Hints on the Development of Small Water Power,* is available on request.

• *Continuing information.* Two periodicals provide a regular dosage of encouragement and advice about how to live a less energy-intensive life: *Mother Earth News* (P.O. Box 70, Hendersonville, N.C. 28739) and *Alternative Sources of Energy* (Route 1, Box 36B, Minong, Wisconsin 54859). Both are directed primarily at rural life, but many of the ideas and schemes can be employed by more urbanized citizens.

Two general information publications are available with overall suggestions for energy conservation:

Hidden Waste, Potentials for Energy Conservation, edited by David Large and available from the Conservation Foundation at 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036 ($3).

Citizen Action Guide to Energy Conservation from the Citizens' Advisory Committee on Environmental Quality, 1700 Pennsylvania Avenue, N.W., Washington, D.C. 20006 ($1.75).

Solar heaters have a wide variety of uses.

Conversation Pieces

Technically intriguing items from TRW, guaranteed to add luster to your conversation and amaze your friends.

Stars and Atoms The molecules and atoms we have here on earth are made up of large volumes of space flecked with tiny dots of matter. For example, if you were sitting in the top row of a large football stadium (e.g., the Los Angeles Coliseum), the upper tier of seats would represent the orbit of a marble-sized electron. The atom's nucleus would be a BB sitting on the fifty-yard line. Everything in between the two would be empty space.

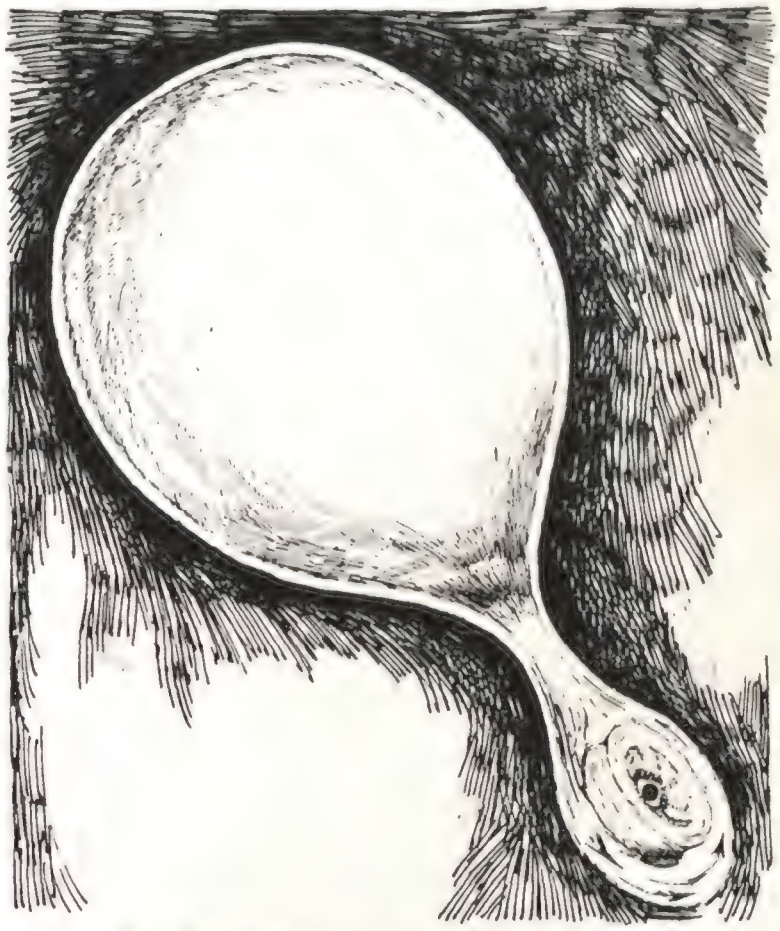
In the interior of stars, matter can be much more dense. For example, when a large star runs out of hydrogen fuel, the immense forces of gravity which have been held at bay by thermonuclear burning within the star suddenly become dominant. As Fred Hoyle puts it, the star has to pay all of its back gravitational taxes at once. The forces of this violent, almost instantaneous collapse are sometimes so great that the electron whizzing around the stadium is driven into the BB sized nucleus on the fifty-yard line. The two opposite charges cancel one another to form a neutron. Then, under the crushing force of gravity, the entire stadium fills up with marble-like neutrons.

Matter of this density exists in the heavens in the form of neutron stars or pulsars. In effect, pulsars are giant atomic nuclei in which the interatomic spaces of matter here on earth have been spectacularly reduced by gravitational collapse. We can learn about the structure of matter in such stars from the high energy radiation they emit.

Imagine now a stellar collapse so violent that the marble-like neutrons themselves are smashed together by the gravitational crush. The matter produced by such a collapse is unimaginably dense. The gravitational field of the resulting stellar object is so intense that no light (or any other kind of radiation) can escape its surface. Hence it is called a black hole. If you shined a flashlight directly on a black hole, you would see nothing for the photons of light would be sucked down its gravitational drain, never to return to your eye.

While black holes cannot be observed directly, their effects on stars unfortunate enough to be near them can be seen. Cygnus X-1 (see illustration) contains the first black hole tentatively identified. The hole is an invisible but dominant component of a binary pair of stars. It is sucking the material of its visible companion into a rotating disk. The violence of the transfer and shredding action heats up the atoms being sucked out of the visible star until they emit x-rays near the black hole, thus indirectly revealing its presence.

Today many physicists are interested in astronomy because much that we have to learn about the fundamentals of matter and energy can only be learned from the stars. That is why TRW Systems is building the High Energy Astronomy Observatory (HEAO) for NASA. The information this observatory will gather beginning in 1977 may well cause us to revise major portions of contemporary physics.



Cygnus X-1. Kip Thorne of the California Institute of Technology performed calculations leading to this model of the black hole. Our illustration is based on a painting of his model by Lois Cohen of the Griffith Observatory.

For further information, write on your company letterhead to:

TRW
SYSTEMS GROUP

Attention: Marketing Communications, E2/9043
One Space Park, Redondo Beach, California 90278

By Donald Gould

Draining the Zuider Zee uncovers a boneyard of ancient ships

Roman to 19th-century, an archaeological treasure trove of wrecks is revealed as Holland's reclaimed soil is put to the plow

Shipwrecks fascinate people; the older the wreck the more powerful its spell. What makes a sunken hulk more exciting than an abandoned railroad car or a battered Oldsmobile in a junkyard? Gerrit van der Heide, director of the archaeology division of the Ijsselmeer Polders Development Authority in Holland, which is responsible for reclaiming land from the Zuider Zee, has a good explanation. "When a wreck is discovered, perhaps centuries after it went down, it is all still there, just as it happened." Van der Heide is in charge of disinterring sunken vessels from what must be the world's richest and most accessible ship graveyard. In the 13th century the sea broke through the dunes along Holland's northern coastline and flooded the lowlands lying between the North Sea and a small inland lake. Thus was formed a shallow, inland sea, the Zuider Zee, into which flowed the rivers Rhine and Ijssel. For hundreds of years all manner of boats sailed the Zuider Zee, but not without paying a price. Because the sea was shallow, gales whipped up waves in a dangerously short time. As a result there was a steep casualty rate among vessels, and the seabed is littered with those ships that were caught unaware.

Now many wrecks are coming to light. As long ago as the 17th century, plans were made for repairing the breach and closing off the inland sea, but nothing was done until a disastrous flood in 1916 made it clear that action was essential. Two years later the Dutch government authorized the construction of a 17-mile-long barrier dam across the entrance to the Zuider Zee, and the drainage of a trial area behind it. By 1930 the first reclaimed plot, or polder, had appeared, and since then something approaching half of the original Zuider Zee has been turned into dry land.

As the old seabed was uncovered, its wrecks at first remained hidden. After sinking they had been covered by subsoil within a year. Only when reclaimed land was worked have the wrecks begun to appear, more than 320 of them. Eventually every vessel which sank within the boundaries of the new polders is likely to be discovered.

Gerrit van der Heide started off as a biologist, attached to a team making a soil map of the newly drained lands to determine their best use. This involved characterizing the subsoil and attempting to date the formation of its layers. One way to do this was to identify the remnants of various living things (such as fossil shells) found at various levels. During the 1930s, 18 wrecks were found in the mud of the first polder. Nobody knew what to do with them, so they were dug up and burned. But in 1943 a ship was uncovered which had settled in soil containing remnants of freshwater mollusks. This meant that at the time the ship sank the area must have been a freshwater lake. It had been assumed that the Zuider Zee had always been salt, and Van der Heide's group realized that if they could only date the vessel they could pinpoint an important stage in the natural history of the land.

It turned out that the wreck occurred during the late 14th century, a relatively warm period when rapidly melting ice in the Alps had produced a strong

Vessel being photographed from helicopter sank around 1840, carrying a cargo of bricks.

Photographs by Loomis Dean

Hourly shower bath at Ketelhaven workshop keeps long-buried wood fittings from rotting in the air.

flow of fresh water down the Rhine and Ijssel. This kept the North Sea salt at bay, which accounted for the mollusks.

A sunken vessel distorts the seabed, but subsequent deposits form undistorted layers over the hulk. If the age of the wreck can be determined, this will date the unbroken subsoil layer above it. From this stratum we can learn something of the climate at that time. One layer, for example, deposited around the mid-17th century, is studded with shells, indicating a period of wild weather when the movement of water was largely from the sea. The layer above it is heavy clay, reflecting a period of calm when river water deposited silt. Dating the wrecks has provided a fairly accurate picture of the time when more than 20 layers of polder soil were laid down.

But how to date a wreck? Although no polder vessel has yet turned out to be a treasure ship, many have contained coins; clearly, a ship could not have sunk *before* the date of the latest coinage found in it. The style of pottery found aboard may also help.

Clay pipes are among the more interesting datable relics. Pipe smoking became popular just after 1600, and clay pipes were soon being made in a variety of shapes which changed fairly rapidly over the years. Records of registered trademarks of pipes still exist so that pipe bowls found in wrecks can be dated. In addition, pipe bowls were frequently decorated with scenes that commemorated particular historical events.

Carbon-14 dating can be used on ship timbers, but it is complex and expensive to perform, so dendrochronology—dating by tree-rings—is often used. The ring pattern of a tree reflects the climate prevailing during the tree's life: Weather favoring growth produces a thick ring; a bad year results in a thin ring. Catalogs of tree-ring patterns stretch back some thousands of years, and it is comparatively simple to place any piece of timber in its proper place on the tree-ring time scale.

The only trouble is that climate, which controls ring growth, varies so widely in western Europe that ring patterns can only date wood grown in the same region as the reference trees. Thus, to date a ship, its building site must be known. Professor Willem Glasbergen of the Institute of Prehistory and Protohistory at the University of Amsterdam has studied the Roman ships found not in the polders but at Zwammerdam, between Leiden and Utrecht. Here, where there was once a Roman camp, Glasbergen found that the caulking between the ship planks contained, along with tar, some reeds and moss peppered with local pollen grains. These microscopic particles were identified in the caulking of one old wreck and proved to originate from two trees, Picea and Abies. The only place these species grew together was along the upper reaches of the Rhine, around the German-Swiss frontier. The vessel, then, must have been built there. This allowed dendrochronological dating of its timbers, and thus two central facts in the ship's history were established by tiny, obscure clues.

Van der Heide makes his home in a church that stands on what was once an island.

On the Ijsselmeer polders, a wreck's age can be determined from the soil. Although the polder ships were originally used to date the subsoil strata, once the age of the soil layers had been worked out they, in turn, could be used to date the ships lying in them.

The drainage of the polders in the Zuider Zee has provided an unmatched opportunity for studying the history of shipbuilding. Until now, knowledge of shipbuilding history has been sketchy. We have not even had much idea of the way ships were constructed during the last century. "We tend to assume that we know a good deal about 19th-century affairs," says Van der Heide, "but the wooden ships in use in those days were not made from drawings. People just knew how to build their boats, and the skills were passed on from one generation to another. No records remain to show us how they set about it. It was only toward the end of the century that shipwrights began to work from

A frequent contributor to SMITHSONIAN, *Dr. Gould described Holland's delta project in September 1972.*

Dutch spritsail barge—probably a ferry—from about 1650 is surveyed after drain-digging exposed it.

drawings, building vessels which are often still afloat."

Preserving the polder wrecks once they are exhumed is no straightforward matter. A ship museum has been set up at Ketelhaven on one of the polders, where the most important wrecks can be displayed. The museum houses a large merchant vessel, 26 meters long, which sank about 1654. This ship, perhaps an East Indiaman, was first discovered 17 years ago, but had to remain in the mud for 13 years before excavation could begin, not only because there was no money available, but also because nobody knew how to set about the required salvage work.

The moment a ship is unearthed the timbers start drying out and, unless something is done about it, they rapidly warp and shrink so that the vessel becomes distorted, gapes at the joints and falls to pieces. To prevent this, the wreck must be continually doused with water while excavation is in progress. Once in the museum, it must still be kept wet.

The East Indiaman and a smaller vessel, 12 to 13 meters long, which sank around 1600, are both surrounded by a network of pipes and nozzles and enclosed by vast "shower curtains." Once an hour a Klaxon sounds, the signal for everybody to make for the far side of the curtains, because the boats are then doused for two minutes by an artificial rainstorm. This hourly wash is the first stage in the long process of preservation. It will continue for some time until the timbers have been desalted. Then a preservative will be added to the spray.

The two boats on display provide excellent examples of two different types of hull construction. The larger vessel is carvel-built, hull planks abutting to form a smooth surface. The smaller is clinker-built, hull planks overlapping like clapboards. Clinker construction was always thought to be the oldest method of shipbuilding, but the vessels dug up so far have shown that carvel and clinker methods have both been used since the 11th century at least.

It is impossible to lift and preserve all the wrecks. They would fill a warehouse the size of Yankee Stadium. But it is also unthinkable that the information they can reveal should be ignored or lost. Therefore an elaborate technique has been evolved for making sure that each wreck gives up all its secrets before it goes to the bonfire which is this time its final grave.

The field work is under the charge of Sybe de Jong and Henk van Veen. They spend their days in the polders devotedly savoring the stories revealed by each new wreck, or in the museum workshops reconstructing their finds in drawings and models. They spend nights and weekends building and sailing their own 20th-century boats.

The ship-digging season lasts for seven months during spring and summer. Only four or five boats are disinterred each year, and the work on each vessel takes two or three months. As each "layer" of a wreck is cleaned up, it is marked with paint at numerous reference points to identify key features. Then a helicopter hovers above each wreck (p. 66) to take stereo photographs. Finally, a set of pictures depicts a series

Flat-bottomed 18th-century barge, perhaps used to carry stone for dikes, intrigues Sybe de Jong.

of horizontal slices of each boat. In the laboratory, specialists trace out the features of the aerials with an instrument somewhat like a pantograph. A tape is punched, a computer fed and a printout produced, which provides De Jong and Van Veen with all the data they need for the design of two-dimensional plans of each boat.

The ships being unearthed at Zwammerdam belong to an entirely different category. They were discovered on the most westerly frontier of the Roman Empire, where legionnaires arrived in A.D. 47 and built a fort marked on contemporary maps as *Nigrum Pullum*, "Black Marsh." Archaeologists have been searching for the exact site since 1960, and excavations in 1968 uncovered adzes, boat hooks and caulking hammers which suggest that there was a shipyard in the vicinity. Toward the end of 1971 the first Roman-era boat was discovered—a dugout canoe. It measured seven meters by one meter, and is undoubtedly a relic of a primitive Germanic tribe.

Since then four vessels have been unearthed, all dating from around A.D. 180, and forming together the largest collection of ships from that period ever discovered. All are of different construction; they ap-

Pots were stowed under the skipper's bunk in a coal barge which sank about 1825.

Found in a Roman boat: oval boss from shield, spearhead, sword, shoe soles of a soldier and a lady.

pear to be transports and fishing vessels, built with planks joined by spars, pegs, iron hooks and nails. Around them are remnants of quays and landing stages, for in Roman times the Rhine ran past the spot.

These Roman-era ships are being excavated by Professor Glasbergen and his University of Amsterdam team. Their aim is to preserve everything that is found, because such ancient relics are very rare. So here all the digging takes place during winter to minimize destructive drying out. By the end of 1972 the dugout and the parts of three other vessels, one 23 meters long, had been taken to the Ketelhaven preservation workshop. Then the diggers discovered that a fifth boat was lying in the mud. From the size of the first timbers uncovered, it looked like a big one, but there was not enough wet winter weather left to allow excavation to continue. The archaeological team of the Ijsselmeer Polders helped the University team prepare the ship for removal. Sybe de Jong, Glasbergen and his assistant, Marten de Weerd, laid bets on how long the new find would turn out to be. De Jong felt sure it was the biggest yet, and put in a bid of 40 meters. He seems to have won the $100 jackpot, for by the beginning of last November when one side of the vessel had been laid bare (it is tilted over in the mud), it was found to be 37.5 meters long and at least seven meters wide and it is, indeed, the largest yet.

For the maritime archaeologists the most intriguing part of Holland's prodigious legacy of buried shipping will doubtless be the wrecks themselves, but for those less technically concerned the objects found aboard stir the imagination. A boat that sank 12 miles from the Zuider Zee shore about 1825 had 200 assorted pots stowed under a bunk in the captain's cabin. Three empty bottles lay in the mud among kettles, spoons, forks and pans in the day cabin. A child's money box, toy building blocks and some little shoes completed a set of clues which suggest that a man and his wife and two small children, between four and six years old, had abandoned ship in a storm, almost certainly to perish.

A ship called *Zeehond* went down in the early 1890s. It belonged to "W Venema" and "A Koerts" (their names are carved on one of the planks). It carried beautiful earthenware, including some Wedgwood and a fine porcelain statuette of a woman. The bowl of a pipe from the wreck bears the words, "My ship is for God." Four pairs of ice skates are among the relics. The boat's main cargo was a load of bricks, and from the way many lay around the vessel, it appears that the people had dumped them in a desperate attempt to avoid disaster.

As Van der Heide says, "At the moment of a wreck, a moment of life is preserved."

Roman vessel, steering oar in background, lures throng at Zwammerdam. Much of hull comes from one tree.

This little girl's "dog" sure looks like a horse —and it is one: a full-grown mare, 24 inches high.

By Maxine A. Rock

A step backward in horse history

Tom Thumb would have been delighted by the efforts of a Georgia breeder to reverse equine evolution and think small

The loose gravel on Moody Bond's long driveway crunches as a car pulls in and the noise alerts the animals. They gambol to the fence expectantly. The car stops and the driver stares down in wonder at what may be the smallest horses in the world.

Suddenly a porch door creaks open and Moody Bond ambles out, tall and gangling, with a knowing grin on his lean, weather-wrinkled face. He nods hello, and then moves off toward the fence, whistling softly. The horses rush to him, straining upward to reach his outstretched hand.

"They like visitors," says Bond. "When folks come, the animals know they're in for some extra attention."

Visitors pull into the 400-acre ranch near Lavonia, Georgia, several times a day. A stand of pecan trees dominates the front yard, keeping Bond's white clapboard house in shadows. Beneath the branches, moving in the dappled sunlight on the lawn, are several of the miniature horses which Bond has been raising for most of his life. "I want a horse 12 inches high," Bond drawls, "One that's the size of *Eohippus,* the ancestor of today's horse. All horses were about 12 inches high to begin with. All I'm doing is reversing the evolutionary process and taking the horse back to where the good Lord started him out."

Scientists would quarrel with the idea that the evolutionary process can be reversed and they might question his 12-inch limit on the height of the earliest horse, for no one is sure of the animal's exact original size. Paleontologists do agree, however, that the horse emerged about 50 million years ago as a timid, fox-sized beast that ran from predators on soft-toed feet. This is known today as *Eohippus,* derived from Latin and Greek, meaning "dawn horse." *Eohippus* roamed North America and Europe for centuries, swishing its long tail and munching on soft leaves and small fruits. When the great paleontologist Richard Owen found the remains of the first horselike creature, he did not suspect it was the ancestor of the horse. *Eohippus* gave rise to at least one variety of descendants with longer legs and larger skulls and teeth better adapted to abrasive grasses. The central toe evolved into the hoof

Descending order: It has taken 30 years, starting with a 60-inch horse like Silver and passing through the 37-inch stage of Rusty, to reach Muffin's size, 25 inches high. And there are smaller ones yet.

Photographs by Ralph Morse

and the lineage produced *Equus*, the horse of the glacial epoch—the direct ancestor of the horses we know today.

Bond is unimpressed by today's horses (they have been bred to pull wagons or win races, he declares), and he seeks to rewind the time clock of equine evolution. But Assistant Professor James D. Satterfield of the Department of Biology at Georgia State University in Atlanta says that Bond can be only partly successful.

"There's a central axiom in evolutionary thought," Satterfield notes. "Once something is lost, it can never be genetically recovered. So there's no good chance at all of re-creating an ancient species. But proper selection could produce a horse that *looks* like its ancestors looked. Genetically, however, it wouldn't be the same, and there might not even be a combination of genes presently in the makeup of the horse that will produce an individual as small as *Eohippus*.

Undaunted, Bond pursues his goal. So far, his smallest animal is Tiny Tim (see p. 79), a three-year-old stallion that stands 19 inches tall and weighs 80 pounds (a thoroughbred racehorse, by comparison, usually weighs about 1,400 pounds and stands over 64 inches). Tiny Tim is the result of 30 years of Bond's exact breeding routine. Each year he selects the smallest three-year-old male with the best conformation and mates it with a well-proportioned, slightly larger mare. This, says Bond, insures an easy delivery for the mare. "Then you wait 11 months to see what you get."

What he usually gets are husky animals that range in size from 19 to 29 inches tall. "I'm breeding for size and good conformation," Bond declares. Some of the animals, however, are oddly proportioned—like Tiny

A handful of Moody Bond's 100-odd minihorses—none here over one yard high—congregate at feeding time.

Tim—with oversized heads and squat, chunky bodies. These are traits which Bond tries to avoid, although in the case of Tiny Tim, the small size of the stallion apparently makes up for what might seem its curious conformation. "I'll stop," Bond says, "when I get a horse down to 12 inches, the size of *Eohippus*."

Bond usually finds out what he has each spring. Some mares give birth in the fields, "but the babies are the size of a little dog, and we could easily lose one in the tall grass. So we try to bring pregnant mares to the front yard. That's our maternity ward. Then we watch the mare day and night, if we have to. Sometimes the babies are so small—ten pounds, maybe—they slip out sac and all, and they'll suffocate if we're not there to run over and tear open the bag."

Within three or four hours the foals are on their spindly legs. If they are healthy—and so far, they all have been—they could live for 25 years, the life-span for an ordinary horse, except that their small digestive systems balk at coarse hay and whole-grain feed.

"I give them fine hay and ground grain, minerals and salt, and all the water they want," Bond says as he smiles at two playful colts chasing one another on the dry, weedy field. One of them tumbles and rolls on the ground, and both tiny animals are momentarily obscured by a puff of dust.

He now has about 100 of the tiny creatures roaming his ranch and several other large pieces of property in and around Lavonia. Bond has perfected his technique to the point where "for the last two years, all the babies have been smaller than their parents. And that's an accomplishment," he adds with a flourish, "because at the beginning we got all damned sizes."

The horses are "a new breed" and are all registered with the American Miniature Horse Registry, a grouping so elite that only offspring of animals already on the roster are permitted to enter the rolls. Bond has consistently used American animals only and spends hours studying bloodlines and keeping records on his horses to avoid brother-sister matings.

"Some millionaires are trying to buy me out," Bond says with amusement. "But I only sell a few of my horses. I still farm a bit, so I don't depend entirely on horses to make my money. When I do sell, each animal is priced individually. I take into consideration where the horse is going, if it will have a good home.

"Doctors, mostly, buy my horses. I don't know why. Maybe it's because they have the money, and they need to relax, and these little things make the most fabulous pets. It seems that older people, mostly, like our horses," Bond continues. "Little children don't seem

In SMITHSONIAN*'s September 1973 issue, Maxine Rock described the birth of Kishina, a baby gorilla, at Atlanta's Yerkes Regional Primate Research Center.*

to know the difference." Nor, it seems, do zoning laws. One day last summer Gerald Williams visited Bond's ranch and returned to his two Maryland nursing homes with a brace of horses 31 inches high. His wife points out that she has dogs that are just about as big and they are allowed, but local zoning laws implacably consider a horse a horse regardless of its size.

Mr. Williams was undaunted, however, and boarded the animals in a more rural part of the state. From time to time the horses have visited nursing homes

Patients at a Maryland nursing home receive two 31-inch high visitors with tentative delight.

to the delight of the patients (below), and Williams is sufficiently encouraged to lay elaborate plans for the animals. He has contacted a famous circus horse trainer who will teach the tiny horses to perform a "kindergarten" act, which will go on the road to entertain at other nursing homes besides the ones Williams operates. He expects to obtain a miniature horse trailer to transport them and a miniature wagon for them to pull. And there will be a contest among his patients to name the horses.

By this summer the patients will have to choose three names. The mare is presently carrying a foal. Williams is delighted at the prospect of having his patients touch and see a colt or a filly only 16 inches high. He agrees with Bond: "Older people especially relate to animals."

Older people are also among Moody Bond's most dedicated visitors. "One elderly lady," he says, "came by ambulance from Florida, and a gent arrived in a cab all the way from Canada."

When they come to the ranch, visitors see the tiny horses grouped in family units: a stallion, five or six mares, and their fuzzy, lamblike colts. Each unit is confined to a separate field, Bond says, because "You can't run a bunch of stallions together or they'll fight."

In one small, protected enclave close to the house, Tiny Tim and his mate, Sausage, doze in the sun. Sausage is five hands high—an inch taller than Tim—and the pair has become a special project for Bond: He hopes they will produce the tiniest horse in modern history. When he leads visitors to their enclosure, the horses ignore him. Bond shrugs. "Spoiled," he mutters.

The other horses are more responsive. As Bond slips between the slatted fence and walks slowly across the yellow-green field, the horses bob toward him gaily like excited puppies. Suddenly a clumsy mare is nipped on the flank by her impatient stallion. The mare leaps away, thudding into Bond and crunching her tiny hoof on his boot. But she is so small she makes no impact. Bond gently pushes her away and she dashes across the field, spurring several other mares and the stallion into flight and kicking up a miniature dust storm as they race through the dry grasses. The foals huddle together, watching the other horses and whinnying softly until the mares move slowly back to their sides.

Another car pulls into the driveway. The stallion leads the way to the fence, trotting briskly as the mares follow behind, all of them anxious for more attention from another surprised visitor.

Tiny Tim, probably the world's smallest horse, at 80 pounds and 19 inches, is held aloft by Moody Bond.

Bryant (right) and Thomas Cole are depicted in
the Catskills in Asher Durand's *Kindred Spirits* (1849).

By Russell Lynes

Countryman-poet let some fresh air into old New York

William Cullen Bryant, writer of 'Thanatopsis,' became a man of affairs in the big city, fostered its arts and preserved its greenery

Bryant portrayed by his friend Samuel F. B. Morse around 1830, before the telegraph invention.

Long before the words "conservationist" and "preservationist" tripped from our tongues, an American poet who trained as a lawyer and became an editor was, in a manner of speaking, both of these. While still in his teens, he wrote a poem more famous than any that later came from his pen, and he wrote a great many in his 83 years. At his death he was unquestionably the most famous American man of letters of his day. The poem, "Thanatopsis," has been called the first great poem written by an American. The gentleman (he was both gentle and manly) was William Cullen Bryant, known to his friends as Cullen. He promoted the concept of American parks and was attending physician at the birth of more New York cultural institutions than most of us today are aware.

Frederick Law Olmsted is commonly thought of as the progenitor of American urban parks (SMITHSONIAN, December 1972), but Bryant was father to the thought. A countryman who had come to New York to seek his literary fortune, Bryant found the city swallowing up open fields and woods. Streams that sparkled in Manhattan were being covered over for streets, and the inevitable progress of the city's grid was pushing rapidly northward, burying the earth beneath cobblestones and brick, leveling copses of trees and despoiling flowering shrubs. "Can we have no fresh air, no green trees, no agreeable walks and drives," Bryant wrote, "that Smith may have more houses to let, and Brown and Co. have less distance to go to their warehouses and ships?"

When Bryant wrote this in 1854, he had been editor of the New York *Evening Post* for 25 years, and had made known his convictions about the need for a proper, not just token, park for the city. Many readers were sympathetic; those who were not could not ignore the breadth and subtlety of his influence. Politicians, developers, entrepreneurs and merchants did not take kindly to his eloquence on behalf of elbow-to-elbow citizens. His editorials were vigorous, often extremely sharp. But it is curious that it was because he was a poet, indeed to most of his contemporaries *the* poet, that circumstances had put him in a position of authority where his measured phrases could not be ignored.

Bryant was born in Cummington in the Berkshire Hills of Massachusetts, the son of a physician and surgeon who made his calls on horseback, wrote light and satirical verse and collected volumes of poetry. Cummington and its vicinity was a young community, sparsely settled in rolling hills when Bryant was born in November 1794. (The sod, he recalled many years later, "was exceedingly fertile, having just been re-

A widely known author on the arts, Mr. Lynes recently wrote a history of the Museum of Modern Art which was excerpted in SMITHSONIAN *of May 1973.*

claimed from the forest.") He was, as one of his father's medical students recalled, "puny and very delicate in body and of a painfully delicate nervous temperament," and to toughen him his father prescribed that he be dipped in the spring "each early morning of the summer months, continuing the treatment, in spite of outcries and protestations . . . so late into the autumn as sometimes to break the ice that skimmed the surface." His biographer makes note that "this was doubtless the first application of hydropathy ever made in those parts."

Something of a prodigy, Bryant could recite the alphabet at 16 months, though he was rather a slouch compared with his older brother who at three had started to read Genesis and, before he was five, according to Cullen, "read the Scriptures through from beginning to end." Cullen spent a year at nearby Williams College, which he enjoyed, but then decided that Yale would give him a broader spectrum. He left Williams but never got to Yale, as his father told him that "his means did not allow him to maintain me at New Haven." He considered the possibility of learning medicine from his father, then settled on law and went to "read" it in the office of William Baylies, a man of imposing presence, in Bridgewater, Massachusetts. After practicing briefly near Cummington, he settled in Great Barrington. It seems to have been an unfortunate choice.

Great Barrington, then a few scattered houses overshadowed by tall elms, was not notable for its concern with culture. Though Bryant published "Thanatopsis," was widely acclaimed and invited to give the Phi Beta Kappa poem at Harvard's commencement—all while he lived at Great Barrington—the people of the village remained unaware that they had a man of letters in their midst. They probably would have mistrusted him as a lawyer had they known.

Bryant was a good citizen and was made justice of the peace. One lady said of him: "A more perfect gentleman never existed, and yet he had a strange fondness for talking with queer and common people—farmers, woodmen, and stage drivers. He would crack his jokes with them at any time, and yet seemed to avoid more respectable people."

He did not dress like a countryman, was scrupulously neat and wore "blue cloth made in city fashion, which to rustic taste seemed a little dandified." He was a small man, slight of stature, with a high, broad forehead, prominent cheekbones, a wide mouth that smiled readily, with rather large, wide-set eyes and what a contemporary described as "clustering, light-brown hair." He did not grow his famous and tremendous beard until he was 58 years old.

He liked to take walks, alone or with a friend, one of whom said, "When he met an acquaintance, his first salutation was, 'Come, what say you for a stroll,' which stroll once begun was apt to last for the greater part of the day."

Bryant disliked the "disagreeable, disgusting drudgery of the law" and, at the urging of literary friends, set out to examine what prospects New York might offer. "Notwithstanding the heat, the noise, and the unpleasant odors," he liked it far better than Great Barrington.

New York in 1825 would either turn away a countrybred man or turn him into a conservationist. It was not yet a metropolis; fewer than 150,000 souls inhabited it, and its northern boundary was Canal Street. Greenwich Village was "a summer resort and place of refuge when the yellow fever raged, as it often did in the overcrowded districts." Constables in huge capes and leather caps kept a cursory eye on the badly lit streets, a few of which were fringed with elms, plane trees and catalpas. The only "parks" were wide areas created by intersections of broad avenues and a 21-acre area around the Battery. Smoke hung over all, except on days when a brisk bay breeze dispersed it and the city took on a remarkable brilliance. Cobblestone streets were strewn with garbage and roamed by scavenging pigs and rats.

"When everybody knew everybody"

Yet it was a magnet, as cities have always been for young writers, and it drew Bryant. He found himself in the company of artists and essayists, of professors from Columbia College, of poets and legal practitioners whom he could admire. He sat with them in taverns at small tables on well-sanded floors and talked about politics and plays, about books and who was to be seen at whose house. It was a time, as Bryant's biographer and son-in-law, Parke Godwin, said, "when everybody

A landmark of Bryant's New York was Five Points, where streets met and brothels abounded.

knew everybody and everybody took part in what was going on. The resources of enjoyment—theatres, operas, concerts, balls and excursions—were limited, but they were open to all."

Bryant drank no spirits (although he enjoyed wine) and could not abide tobacco, but this did not restrain him from long evenings of conversation, especially with a group of men who called themselves the Bread and Cheese Club. The club had been founded by James Fenimore Cooper and included artist John Vanderlyn (famous for his luscious nude, *Ariadne Asleep on the Island of Naxos*) and the sprightly and charming painter Samuel F. B. Morse, long before he became an inventor. Here was the companionship for which Bryant had thirsted.

For a while he worked as editor of the monthly *New York Review*, first at $1,000 a year. But the magazine got into financial trouble, merged with another and became the *United States Review and Literary Gazette*. Bryant was rewarded with a quarter-ownership and a salary of $500 a year, the meagerness of which, to his dismay, drove him briefly back to practicing law. When the editor of the New York *Evening Post* was thrown from his carriage by a runaway horse, Bryant was taken on as assistant editor. He became the paper's guiding spirit and when the editor died in 1829, Bryant took over and stayed for 49 years.

In 1836 Bryant expressed hopes that the city fathers would set aside an expanse of land for relaxation and restoration of lagging spirits, but not until he had been the *Post*'s editor for 15 years did he speak out publicly. On a hot day in July 1844, he went for a stroll in the largely uninhabited middle of Manhattan Island looking for what might be a possible site for a park of adequate size and serenity, and on Monday, July 3, the evening of the holiday exodus, he wrote an editorial called "A New Park." That same issue of the paper listed excursions that New Yorkers might take on the Glorious Fourth—"For Staten Island and its romantic hills and groves, take the ferry at Whitehall"; "The steamboat *Thomas Salmond* goes to the Fishing Banks for a Fishing Excursion and Cotillion Party and in the evening goes up the Hudson"; "To Rochelle, Glen Cove, Oyster Bay, Cold Spring and Whitestone, take the steamboat *American Eagle*."

"The heats of summer are upon us," Bryant wrote. "If the public authorities, who expend so much of our money in laying out the city, would do what is in their power, they might give our population an extensive pleasure ground for shade and recreation in these sul-

try afternoons, which we might reach without getting out of town." Specifically, there was a plot known as Jones's Wood, "a tract of beautiful woodland . . . thickly covered with old trees, intermingled with a variety of shrubs. The surface is varied in a very striking manner, with craggy eminences, and hollows, and a little stream runs through the midst." Its eastern boundary was the East River whose "swift tides . . . sweep its rocky shores, and the fresh breeze of the bay comes in, on every warm summer afternoon, over the restless waters."

Not everyone agreed with him. Commercial interests did not want to give up that nice parcel of river front; the *Journal of Commerce*, which represented their point of view, denounced the idea as a preposterous extravagance. To this Bryant replied, "Every investment of capital that renders the city more healthy, convenient, and beautiful, attracts both strangers and residents, and leads to a liberal patronage of every department of trade." Others thought Bryant's suggestion too modest, and that a place in the center of the island halfway between the two rivers should be considered. In any case the seed of a park had been sown and Bryant did not let the matter rest. When he was in England the following year, he wrote glowingly of the parks in its capital, "the lungs of London."

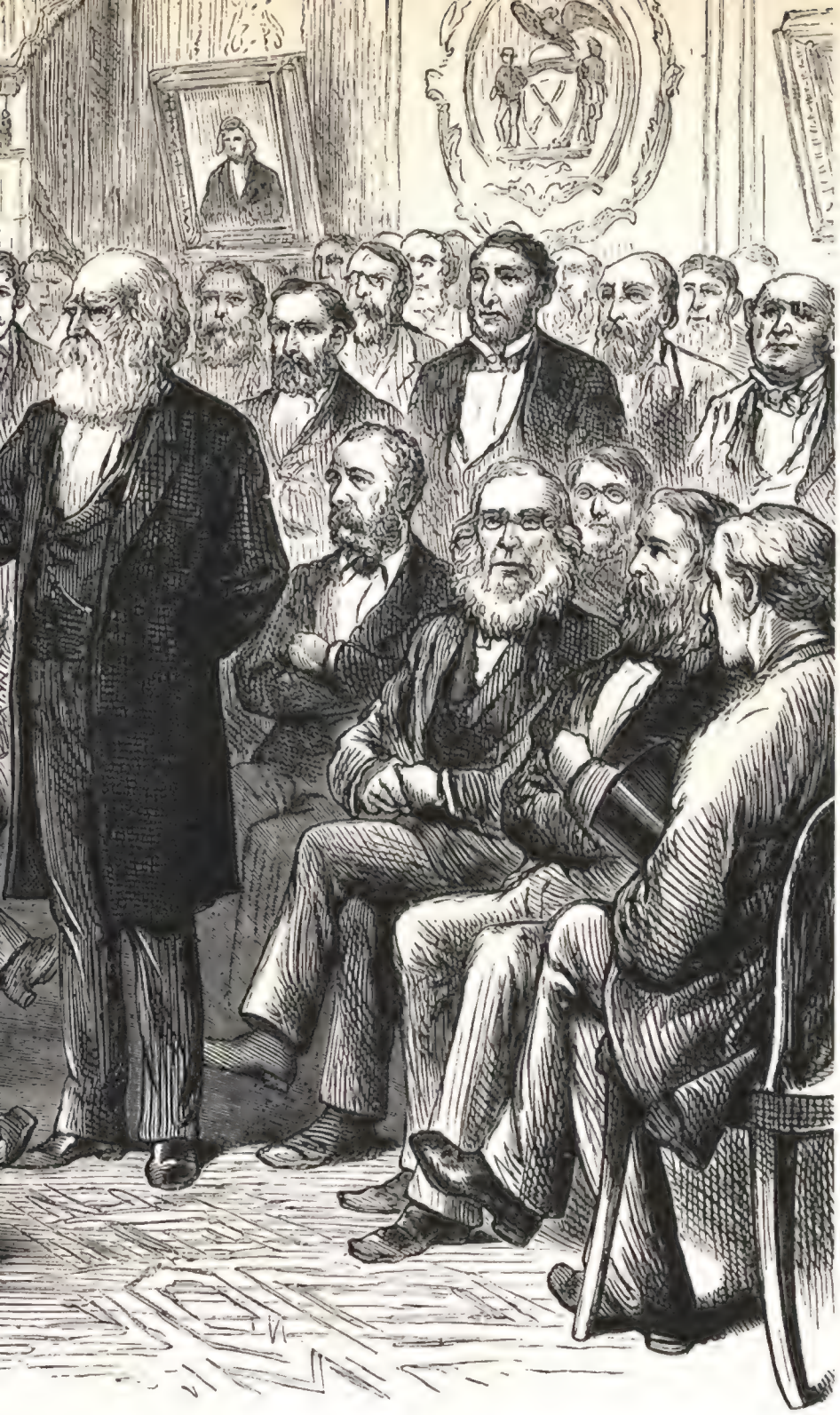
If Bryant watered the seed conscientiously, it was his young friend Andrew Jackson Downing, a landscape architect and editor of the widely read *Horticulturalist* magazine, who fertilized it. So successfully did he sound the necessity of a great park for New York that he, not Bryant, has commonly been regarded as its legitimate father. He brought the young English architect Calvert Vaux to America as his partner and introduced Vaux to Olmsted. Vaux and Olmsted designed Central Park in 1858.

Downing liked to cultivate the romantic landscape;

Prominent citizens of New York meet to discuss municipal reform. Bryant makes a proposal.

Cullen Bryant preferred it raw. As a friend put it, he was "the most indefatigable tramp I've ever grappled with. A baker's biscuit and a few apples seemed to suffice him for food; and he put up cheerfully with the rude fare of wayside inns and laborers' cottages. His knowledge of soils and seasons, his interest in agriculture and the modes of life and opinions of the farmers soon got him into pleasant chats with the people he encountered." On one occasion Bryant made his way from New York to New Milford, Connecticut, by steamer and train, and from there walked along the Housatonic River to Great Barrington, 50 miles, then to Cummington, another 40.

At 70, Bryant went right on battling the despoilers of the land, and in an article in the *Post* on June 20, 1865, he pointed his pen like a dart at those who would lay waste the forests. "While Congress is occupied with



He grew his famous beard in 1852, while he was traveling through Europe and the Near East.

the disposition of the public lands," he wrote, "it has been suggested, by persons who can think of something else besides railroads, that it will be an act of provident wisdom to reserve considerable tracts of forest in different parts of the country, as the public domain. . . ."

There was no one with whom Bryant more enjoyed walking in the forests and along the banks of streams than his friend Thomas Cole, painter of landscapes and founder of the Hudson River School. Cole had a small house on the west bank of the Hudson in the shadow of the Catskills, and there he and Bryant explored trails and ravines for days on end. Bryant's conservationist concerns were intimately allied to his concern with the arts. He was not just a friend of artists (50 of them gave him small paintings on his 70th birthday), he was a promoter of the arts, a patron and a preservationist at a time when all three were rare.

Bryant began to rub elbows with artists at the Bread and Cheese Club. When Cooper, its guiding spirit, left for Europe in 1826, it died; a few years later it was replaced by the Sketch Club of which Bryant was a charter member and active participant. All of its original 21 members were artists or writers about art, and they were as much given to high jinks and good but simple food and wine as to serious conversation and sketching. The Sketch Club was dissolved because the members got tired of the system of meeting each week at a different member's house. In 1847 the Century Club was organized, and again Bryant was one of its moving spirits. The club's constitution decreed that it "shall be composed of authors, artists, and amateurs of letters and the fine arts. . . ."

Soon after his arrival in New York, Bryant had been asked by his friend Morse to lecture on ancient mythology at the newly founded National Academy of the Arts of Design, presided over by the dictatorial and arrogant Colonel John Trumbull. For the rest of his life Bryant was one of the staunchest supporters of the National Academy, wrote about it in the *Post*, presided at its dinners and encouraged the public to support its artists. When in 1844 the American Art Union was formed, Bryant was its president. The Art Union was the first large art promotion ever launched in America. It grew out of a plan devised in 1838 by a young painter named James Herring, who had a small art shop in New York called the Apollo Gallery. Sales of pictures were poor, and so he invited the public to subscribe for membership in what he called the Apollo Association at $5 a year. This entitled each member to an engraving of a painting and a lottery ticket which, if he were lucky, would win him a "hand-painted" picture. The scheme worked, artists were enthusiastic and out of it grew the American Art Union.

Art for "humble dwellings"

To Bryant the Art Union represented a truly democratic patronage of the arts. It spread art far and wide across the country (at least as far as the Mississippi) and put engravings of works by serious American artists in what were then called "humble dwellings." It was a great leg up for the artists from whom the Art Union at its peak bought as many as 400 paintings a year and, as Bryant said: "The plan of our Institution is precisely what the people of our country want. . . . It commends itself to their good sense that when you offer them a method of encouraging the Fine Arts, suited to their means, and to the equal condition of society among us, they adopt it readily and support it zealously." Bryant continued as president of the Art Union for three years. It grew to still greater size after he withdrew, but it foundered on the rocks of jealousy

An aging Bryant was photographed by Mathew Brady. He bought his Long Island farm (opposite) in 1843.

in 1851. It was attacked by artists whose work it did not buy and, under their pressure and with the aid of the New York *Herald,* it was declared by the New York state legislature an illegal lottery.

Bryant believed in a democracy of the arts, but was not sanguine about the quality of the people's taste. Among his many artist friends was sculptor Horatio Greenough. He wrote Greenough when the sculptor was working on his massive figure of George Washington, originally intended for the rotunda of the Capitol and now in the Smithsonian's Museum of History and Technology. "I am glad to hear you are so far advanced with your statue," he said. "Never mind as to what Mr. [Edward] Everett says about the necessity of sacrificing your taste as to what he may suppose to be the taste of the public. As you are to execute the statue, do it according to your own notions of what is true and beautiful, and when Mr. Public wants a statue made after his own whims, let him make it himself. If you undertake it, give us a Greenough; the statue deserving it, the popularity will come sooner or later. Mr. Everett talks like a politician, but a politician of a bad school, nor has he gained much by following his own maxims."

America had no art museum other than the galleries of the New York Historical Society when Bryant was at the peak of his career. There were a few private galleries, open on occasion to the public. One was in the house of his friend Luman Reed, a retired wholesale grocer who was the principal patron of Cole and Asher Durand. Not until Bryant was well into his seventies was such a museum started. On November 24, 1869, a group of some 300 prominent New Yorkers met formally at the Union League Club to plan the Metropolitan Museum of Art. Three years before, John Jay, a distinguished New York lawyer, at a celebration of America's 90th birthday in Paris, had remarked in an official speech that it was time "the American people lay the foundation of a National Institution and Gallery of Art."

Clearly, any such cultural institution that wanted authority and dignity had an advantage in the venerable Cullen Bryant's sponsorship. He presided at the meeting and discussed where the money was to come from: "My friends, if a tenth part of what is every year stolen from us . . . under pretense of public service, and poured profusely into the coffers of political rogues, were expended on a Museum of Art, we might have, reposited in spacious and stately buildings, collections formed of works left by the world's greatest artists, which would be the pride of our country."

Bryant lived to see the Metropolitan Museum open in temporary quarters. He did not live to see completed the building designed by his friend Calvert Vaux in the Central Park that he had been so important in making a reality. It was in the park that Bryant's final illness seized him. He was there to speak at the unveiling of a statue and it was evident from the lack of vigor in his voice that he was not well. He left the ceremonies on foot and at a friend's doorstep he fainted, fell and hit his head against the stone steps. A little more than two weeks later he died of a brain hemorrhage. The author of "Thanatopsis" (view of death), as he had titled his ode, was then 83.

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Book reviews

The Way to Go: The Coming Revival of U.S. Rail Passenger Service
Thomas C. Southerland jr. and William McCleery
(Simon and Schuster, $8.95)

U.S. rail passenger service got a timely boost with the energy crisis. Plane, car and bus riders have started taking the train. In November and December 1973 passenger business was up about 35 percent above normal, and a new regional network was created by the Rail Reorganization Act to prevent further deterioration of railroads.

Another beneficiary of the crisis may be this book—its plea for improving passenger trains will now be raised a few significant decibels. By showing first how good European and Japanese trains are, next how bad and forlorn American trains have become, and then how far we could go with more innovations like the Metroliner, the Bay Area Rapid Transit (SMITHSONIAN, June 1972) and the Lindenwold Line outside Philadelphia, the authors make a convincing case not for merely reviving rail service but for improving it beyond anything we have today.

Perhaps the authors reach too far. One of their key chapters, "Far-out Trains in Our Future," devotes 20 pages and five diagrams to a befuddling description of the futuristic devices they feel we must ride by the 1980s and later. They manage to keep one foot in reality with a quotation from Joseph Vranich, formerly of the National Association of Railroad Passengers and now with Amtrak: "We should not allow consideration of esoteric systems—such as tracked air cushion vehicles —to be an excuse for not taking action to improve conventional rail and bus transit. The exotic system may not be ready for another ten years."

What our passenger trains need, then—and the authors are not remiss in making this point—are smooth, on-schedule, 100-mile-an-hour rides *now* and not 500-mph bullets that run through vacuumized tubes in 1984. Southerland and McCleery, both of Princeton, pay homage to the nearby Lindenwold Line and to other good commuter lines. They praise several long-distance leisure trains that Amtrak has installed as vacation specials, but they largely ignore the workhorse intercity trains. The Santa Fe Super Chief from Chicago to Los Angeles, the Coast Starlight along the Pacific and the non-Amtrak Southern Railway's Crescent between Washington and New Orleans still provide adequate service, but should be pushed to better things.

Certainly all of the authors' facts, statistics and arguments are in order. What one misses, though, is the feel, smell and touch of the trains themselves.

—David Butwin

A New York free-lance writer who rides, and frequently writes on, trains

The Salmon: Their Fight for Survival
Anthony Netboy
(Houghton Mifflin, $15)

In his weekly magazine, *All the Year Round,* of July 20, 1861, Charles Dickens issued the now familiar cry of "Salmon in Danger!" He editorialized: "A few years, a little more overpopulation, a few more tons of factory poisons, a few fresh poaching devices . . . and the salmon will be gone—he will become extinct."

Fortunately, there is still time, even now, to save the salmon. And should these fish be rescued and restored over wide portions of their range in the northern latitudes, this new book will have played an important role.

It is a definitive work by the author of *The Atlantic Salmon: A Vanishing Species?* It affords a comprehensive and cohesive view of the six species of Pacific salmon and the steelhead trout, as well as the Atlantic salmon. They are all anadromous fish, born in fresh water, spending their adult lives in the sea, then returning to the same rivers or lakes where they were born, defying every obstacle in order to spawn and give new life.

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I GOTTA RIGHT TO SING THE BLUES
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I MUST HAVE THAT MAN
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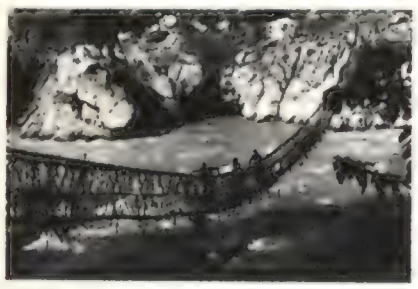

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Ecology. Edward Cronin, Jr. and Howard Emery, M.D. of the Association for the Conservation of Wildlife, Bangkok, continue their ecological study, with emphasis on bird life, in the Himalayan forests of Nepal. April 15 to May 5. $1190*

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Dr. Alfonz Lengyel, head of the American section of a four-nation UNESCO project at Carthage, begins a 5-year excavation of this ancient Punic and Phoenician site. May 19 to June 1; June 2 to 15; June 16 to 29. $690*

Geology. Dr. Frances Dakin leads a search for the volcanic core of the Simien Mountains of Ethiopia. April 7 to 24. $990.*

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What guides the salmon from home to sea and home again? No one can say.

Perhaps sight, chemical composition of the water or temperature serve as cues. Probably some combination of them, plus other instinctive forces too mysterious for human understanding. Netboy treats admirably the romance and science of the salmon, tracing their evolution and life history, their migration patterns and, above all, their relations with Man from stone-age simplicity to nuclear-age chaos. Toward that end, Netboy has pursued the fish halfway around the world, finding tragic decline and deterioration.

In Europe, the salmon species has vanished completely from Portugal, Switzerland, Denmark and Belgium, and is quite scarce in Spain, France, Poland, Holland and Germany. In England and Wales, the numbers of salmon have declined to an all-time low. On our continent, Wilfred Carter of the International Atlantic Salmon Foundation is quoted by Netboy as follows: "In Nova Scotia, New Brunswick, and that part of Quebec south of the Saint Lawrence River, my crystal ball indicates that salmon are fighting a losing battle. . . ." And, as Netboy notes, "The fate of the Connecticut River illustrates the process by which Americans, in their prodigal exploitation of natural resources and lack of a conservation conscience, deprived themselves of a substantial source of food."

So it is almost everywhere. Of the once-great salmon rivers of California, only a few in the northern section still boast large numbers of salmon and steelhead. Alaska, despite its more than 2,000 salmon streams, may be the next to go.

The survival of salmon depends on restoring and sustaining the condition of rivers in which they are born, and sufficient protection in the oceans from Man, their chief predator. To try to maintain the status quo is not enough. That course invariably leads to attrition or, at best, "mitigation" of loss. In addition to protecting the existing resources, we should restore the salmon's depleted habitats.

Certain positive actions have been taken, which the book details. The reader cannot avoid Netboy's overriding lesson: "A world in which fish cannot live will soon be a world in which Man cannot live either."

—*Michael Frome*
Conservation editor of *Field & Stream*

Maverick Inventor
Peter C. Goldmark
(Saturday Review Press/Dutton, $7.95)

Dr. Peter Goldmark, at the end of a long and illustrious career as resident inventor at CBS, found himself in a position not unlike that of inventor Alfred Nobel. Having irrevocably changed society by inventing devices that hold the potential for both good and evil, Goldmark is devoting his later years to contemplating their impact on society and to encouraging their constructive use. What would society be like, after all, without the long-playing record, color television, audio and video cassettes and a long list of other Goldmark innovations?

Goldmark's own answer is ambivalent. Either technology will bring us all together, he seems to say, or it will hang us all separately. Painfully aware of the pervasiveness of the devices he has created, Goldmark now wants to leave us with a dream of the New Rural Society, strung together by the very telecommunications techniques he worked a lifetime to develop. It is to this concept that Goldmark has devoted his post-CBS years and the last chapter in his autobiography.

The rest of Goldmark's book, which can be read in a gulp, thanks to the work of collaborator Lee Edson, chronicles his 35 years at CBS and is a deliciously partisan history of CBS itself—from the day when it was bought by cigar tycoon Sam Paley of Philadelphia to the day when Goldmark turned down a million-dollar, plush-but-powerless job as "consultant" to CBS after the mandatory retirement age of 65.

The consistent shortsightedness of CBS's dollar-minded chairman, William S. Paley, and his staff is one of the central themes of the book. CBS officials looked askance at such innovations as video-tape recording, the LP record, color TV, UHF channel broadcasting and the integrated circuit. "The transistor is a toy," one engineer characteristically advised board chairman Paley. "It will never beat the vacuum tube."

Even after Goldmark had established his chrome-bright track record, every CBS budget review posed a mortal threat to his lab. As often as not, it was only Paley's desire to outdo his rival, David Sarnoff at NBC, that would create support for Goldmark's ideas. One day, as Sarnoff and Paley sat together in the Supreme

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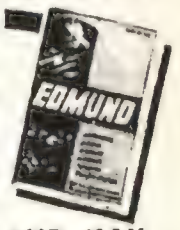

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Court chamber waiting for a decision on which of them would be given a commercial license to proceed with a color TV system, Sarnoff said to Paley, "Bill, we could have avoided this headache if I had hired Peter in the first place." CBS won that court battle, yet with each later innovative idea Goldmark would be branded "the mad Hungarian" again.

Perhaps that is the plight of the inventor whose survival depends on intuitive bursts of insight that may seem utterly improbable to others. Indeed, reading the chapter on the utopian New Rural Society, one does feel that Goldmark could have left social problems to others and stuck to technological ones. But, after all, he is the inventor, and whoever laughs at an inventor does so at his own peril.

While this autobiography leaves much to be desired as a literary work and historical document, it does allow us to sit back for an afternoon, watch one of our most original minds at work and be amazed.

—Jim Gaines

A free-lance writer who produces a news program for WNET/13 in New York

Maine Pilgrimage: The Search for an American Way of Life
Richard Saltonstall jr.
(Little, Brown, $10)

In many respects Maine has always been a hard land. The soil is thin and rocky, the weather is fickle and often harsh, and the ways of making a good living from the land are few. Yet the state's *genius loci* has kept some at home, has caused others who left to return, and has lured many visitors back again and again.

Because 19th-century industrialization largely bypassed Maine, the state has retained much of its heritage intact. Today, however, Maine is being drawn further into the vortex of 20th-century life. As a consequence, conservationists fear that the state's rugged beauty and its old, tested ways of living are in danger.

Saltonstall starts off with the coast. From Kittery to Eastport there is plenty of evidence that tourists, oil men, realtors, heavy industry and the local residents themselves are putting this part of Maine under extreme pressure. Rather than see the coast overwhelmed, the author would prefer to have Maine people build only upon what they possess.

The beauty and the precarious condi-

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tion of the wildlands, Baxter State Park, the upper section of the St. John River, and the Maine woods come next, followed by an enumeration of alternative ways of making a living on the land.

Saltonstall isolates the basic Maine dilemma: how to plan for wise future use of the land while providing at the same time for the people to earn enough to enjoy what they have. The author's is a personal view for which those who have struggled to eke out a living in Maine may have some sympathy, but which in itself presents difficulties for the Maine citizen with few financial resources.

More than four decades ago American forester-naturalist Benton MacKaye asserted that there were three kinds of environment essential to human well-being: the rural, the urban and the primeval. If he was correct, perhaps Saltonstall's program for Maine may not be too far off the mark. Wherever the truth lies, no one can conclude that the task of providing the proper mix for Maine will be easy.

—Edward Schriver
Associate Professor of History,
University of Maine

Adventures with D. W. Griffith
Karl Brown
(Farrar, Straus and Giroux, $10)

Karl Brown, later to become a notable cameraman *(The Covered Wagon)* and an occasional film director *(Stark Love)*, was fortunate enough to have spent his apprenticeship (and a good part of his adolescence) with D. W. Griffith and his cameraman Billy Bitzer. And it is to our advantage that Brown did so, for he has written such a thoroughly enjoyable and engrossing account of the early days (and nights) of Griffith's film studio that we can now see as truth what we once took for myth—that these were full-blooded men, inventors, comics and dreamers, pioneers in the finest sense.

Told in the rambling style of loved reminiscences, the author peppers his chronological account of his part in Griffith's California days with numerous anecdotes about productions: He almost accompanied Mae Marsh's dummy over a cliff during the shooting of *The Birth of a Nation* and when Griffith wanted to have one of the huge towers in *Intolerance* "totter and fall right into the camera," Brown got the assignment.

As assistant to Billy Bitzer on every Griffith production from *Home, Sweet Home* to *Broken Blossoms*, Karl Brown not only set stage lines and loaded film magazines but created many of the special effects that appear in Griffith's California pictures. The opening shot of Limehouse in *Broken Blossoms*, with its shimmering waters and ships swaying at anchor, drew particular praise from the London critics as being an "exquisite vignette" and a striking example of Bitzer at his best. It is, in fact, one of Brown's shots, which he describes in detail from conception to fruition.

The book contains many fine photographs, such as a Hollywood street corner, with California bungalows in the foreground and the Babylonian towers of *Intolerance* rising in the background.

—Carl Colby
Film lecturer at Georgetown University

The Babylonian set of *Intolerance* gave flair to the Hollywood skyline in 1915.

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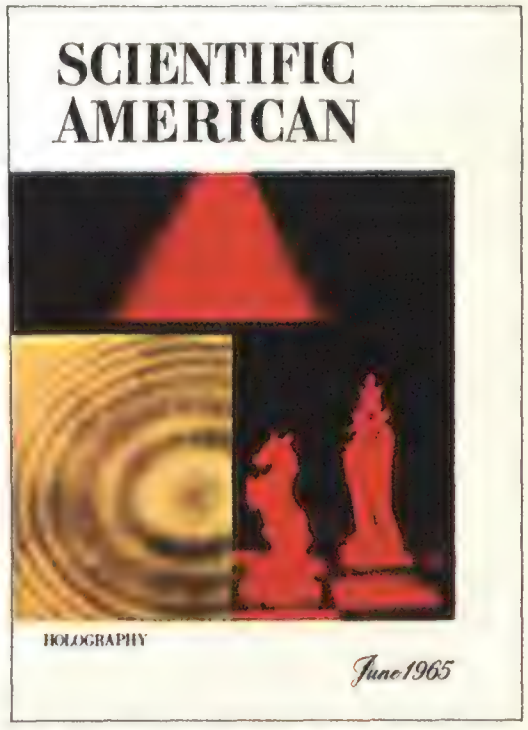

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FOREIGN STUDY TOURS

Sites of Civilization Cruise: From Rome to Athens, via Sicily, Malta, Tunisia, Egypt, Thera and Cyprus on the spacious yacht *Argonaut,* chartered especially for Smithsonian Associates—April 5-27.

Greece: Sites and flowers in northern Greece and the Peloponnesus—April 27-May 11.

Victorian Germany: Castles and palaces associated with Queen Victoria, including Prince Albert's birthplace at Rosenau—May 7-25.

Ethiopia and Kenya: Ancient and contemporary cultures from Aksum to Lalibela, plus several days in Kenya—May 7-25.

Black Sea Cruise: Depart and return Athens, via Turkey, Bulgaria, Romania and Russia—September 18-October 6.

Afghanistan and Pakistan: Archaeological and historic sites—October 20-November 16.

DOMESTIC STUDY TOURS

California Channel Islands: Seven days aboard a 95-foot sport-fisher yacht as you study the unusual bird and plant life on eight Channel Islands off California's spectacular coast—April 15-22.

San Antonio, Texas: The San Antonio Fiesta, a tradition since 1891, and its vibrant, colorful history and multicultural heritage. Informal lectures and discussions with local groups and historians provide an in-depth view of the fiesta activities—April 20-26.

Crafts of Arkansas: A rare opportunity for an intimate encounter in seldom visited areas to observe early craft techniques and the artisans preserving them—May 12-18 or May 19-25. (Each tour limited to 12 participants.)

Santa Fe and Taos, New Mexico: A comprehensive look at the Indian, Spanish and Anglo-Saxon cultures which comprise the heritage of the Southwest. From the missions and pueblos to the museums in Albuquerque, participate in discussions, films, lectures and field trips—June 19-27.

Boston Art and Architecture: Federal and Georgian architecture and a visit to the Museum of Fine Arts; a reception at the Bulfinch building which houses the Smithsonian's Archives of American Art—June 21-24.

For information on specific tours, write Miss Bliss Schumann, Foreign Tours, Room SI 123, or Mrs. Rosa Mae Howe, Domestic Tours, Room SI 106, both at Smithsonian Institution, Washington, D.C. 20560.

Smithsonian highlights

Anacostia Neighborhood Museum
The "Seventh Annual Young People's Festival of the Arts" features live performances by adult and children's groups from the Washington area. Rock and dance-band concerts, choral groups, gospel singers and plays are presented weekdays and weekends from March 11-April 11. For reservations and program information, call (202) 678-1200.

National Air and Space Museum, Arts and Industries Building
"Exhibition Flight" demonstrates barnstorming, air racing and aerobatics with the Waco 9, Pitts Special, Turner Special and Bücker Jungmeister on display. Continuous films of air shows are featured in a grandstand theater and a simulated barnstorming flight and wing-walking stunt are also included—opens mid-March.

Musical Weekend in Washington
The third annual musical weekend, featuring concerts in settings from the National Zoo to formal blooming gardens, will be held May 10-12. Included in the weekend are tours of Smithsonian museums, dinners in the historic Smithsonian "Castle" Building and private Georgetown homes, a Mozart concert played on antique instruments from the Museum collection and a reception at one of Washington's most beautiful embassies. A limited number of reservations are available. Write: Musical Weekend, Museum of History and Technology, Room 4123, Smithsonian Institution, Washington, D.C. 20560.

Divisions of Performing Arts and Musical Instruments

"Music from Marlboro" presents seven distinguished artists from the celebrated music festival playing selections from Bruckner, Bartók and Mozart—March 2, 5:30 P.M., Baird Auditorium, Museum of Natural History.

"String Bands Old and New" features Ralph Stanley & The Clinch Mt. Boys, singers, composers and banjo pickers—March 10, 4:30 P.M. workshop, Museum of History and Technology; 8 P.M. concert, Baird Auditorium, Museum of Natural History.

"There's a Good Time Coming" is a program of American music of the mid-19th century and ballroom dance under the direction of Shirley Wynne—March 11, 8:30 P.M., Grand Salon, Renwick Gallery.

Carmen McRae, one of the great jazz vocalists of the century, performs in the "Jazz Heritage Series"—March 17, 4:30 P.M. workshop and 8 P.M. concert, Baird Auditorium, Museum of Natural History.

"Baroque Music and Dance of 18th-century France" presents the Juilliard School of Music and the Baroque Dance Ensemble in selections from Scarlatti and Rameau—March 24, 8:30 P.M., Baird Auditorium, Museum of Natural History.

For information on the above events, call (202) 381-5395.

Museum of History and Technology, Hall of Photography

"American Masters" is a continuing exhibit of 50 recently acquired works by 12 major American photographers. Included are photographs by Ansel Adams, Lisette Model, Harry Callahan, Jerry Uelsmann, Lee Friedlander, Paul Caponigro and Diane Arbus.

National Collection of Fine Arts

"Art of the Pacific Northwest: From the 1930s to the Present" is a continuing, major exhibit of 80 paintings, 20 sculptures and 20 drawings. Featured in the survey of four decades of Pacific Northwest art are the works of 45 artists, including Mark Tobey, Morris Graves, C. S. Price and Kenneth Callahan. A mystical quality often characterizes the work of these artists.

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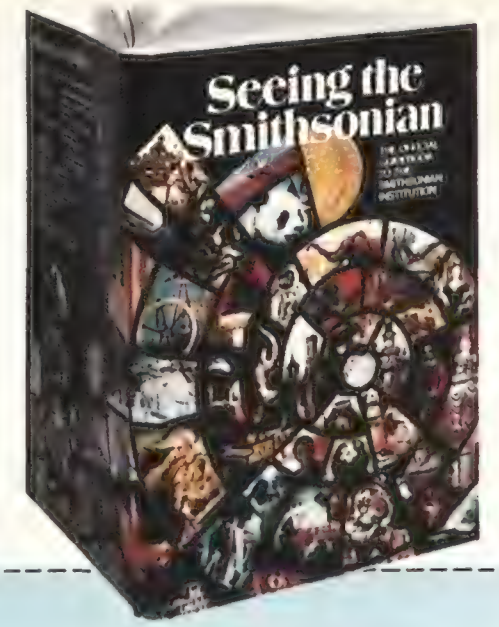

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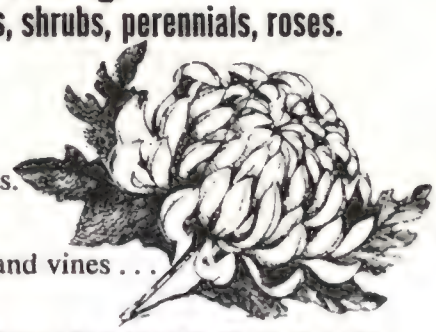

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Museum of Natural History
"A Discovery Room" is a new "touch and feel" exhibit designed to intensify the museum experience. It consists of shells, fossils, woods, teeth and other specimens available to the visitor for examination—opens March 5.

"It All Depends" is a continuing exhibition dramatizing how all living elements in an environment are dependent upon each other for survival. Included are a tidal pool, desert niche and, at the center of the exhibit, a realistic, 54-foot-high tropical rain forest.

Smithsonian Commons
Luncheon facilities for Smithsonian Associates are in the original Smithsonian Building. Open Monday through Friday from 11:30 A.M. to 2 P.M., the Commons offers a buffet luncheon and salad bar from $1.50 to $1.95. Also available are coffee and pastries from 10 to 11 A.M., and pastries from 2:30 to 4:30 P.M. Presentation of an Associates' membership card is required.

Parking on the Mall
Metro construction has made parking on the Mall near the Smithsonian complex extremely difficult. All parking prior to 10 A.M. is restricted. The use of public transportation is recommended.

Contributing Memberships
Persons who contribute $50 or more annually to the Associates support the Institution's national educational programs and enjoy additional privileges. Graduated benefits include:

- Assistance in communicating with any part of the Smithsonian.
- Information on any museum in the world in advance of a visit there.
- Smithsonian annual report and other publications.
- Invitations (when in Washington) to exhibition previews and special events, including admission of a guest.
- Research service for questions about subjects related to the Smithsonian.
- A remembrance from the Smithsonian in the form of a commemorative object or work of art. Write: Contributing Membership, Smithsonian Associates, Smithsonian Institution, SI 118, Washington, D.C. 20560.

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Report for Associates

The latest volume of a new quarterly publication, the "Smithsonian Institution Research Reports," discusses studies ranging from the sedimentology of the Mediterranean to the vanishing techniques of Asian potters and preservation of natural resources in the Chesapeake Bay area. Reports of other Smithsonian research projects are also included. For a free copy, write: Smithsonian Associates' Reception Center, 1000 Jefferson Drive, Washington, D.C. 20560.

Puppet Theater

"Pinocchio" continues on Wednesdays, Thursdays, Fridays and weekends until March 10, when the theater will be closed temporarily due to construction in the Arts and Industries Building. For ticket information and performance times, call (202) 381-5395.

Traveling Exhibition Service

There are up to 70 different Smithsonian-sponsored exhibitions on display each month throughout the United States and Canada. For a complete listing and information on how to bring an exhibit to your area, write: Traveling Exhibition Service, Smithsonian Institution, Washington, D.C. 20560.

- Jacksonville, Florida—"Antwerp's Golden Age" (Cummer Gallery of Art, March 23-May 5).
- St. Louis, Missouri—"Huddinge Hospital: A Public Environment" (Washington University School of Architecture, March 16-April 14).
- Memphis, Tennessee—"Makonde Sculpture" (E. H. Little Gallery, Memphis State University, March 2-31).
- Chicago, Illinois—"Manuscripts of the American Revolution" (Chicago Historical Society, March 9-May 26).
- San Diego, California—"Meteorological Optics" (San Diego Hall of Science, March 10-April 8).
- Austin, Texas—"Permutations: Earth, Sea, Sky by Lawrence Calcagno" (University of Texas Art Museum, March 2-31).
- Billings, Montana—"A Children's World (III)" (Yellowstone County Fine Arts Center, March 9-April 7).
- Anchorage, Alaska — "Contemporary American Drawings (V)" (Anchorage History and Fine Arts Museum, March 23-April 21).

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By Donald Gould

American medical dolce vita and envy from Britain

As the long, cold, dark and dreary winter drags on here in England, I'm particularly anxious that British doctors shouldn't get sight of an American publication which recently came my way. It's called *Rx Sports and Travel,* The Leisure Magazine for Physicians, and I'm afraid that if workers in the damp and chilly medical field on this side of the Atlantic were to become infected by the message it carries, they might pack their little black bags and emigrate en masse.

Rx Sports and Travel is a glossy, four-color job devoted to description of the kind of dolce vita which the common man over here believes to be the exclusive lot of hereditary peers and the publishers of girlie magazines. The *"Rx"* in the title of this hedonist's handbook is, of course, the mystical sign with which physicians may have prefixed their prescriptions since the days of Horus the Egyptian sky-god, but the publishers have brought the token up-to-date (see drawing), making it symbolize the life-style of today's dedicated healer.

Mind you, I've nothing against the honest laborer taking his well-earned ease, but a study of the pages of RS&T does suggest that the American physician expects to enjoy a more than average helping of the pleasures of this world. It is the ads, in particular, which provide the siren song which might lure the simple-hearted and plain-living medical men of this island away from their duties.

One is headed, "What are you doing this weekend? The usual? Again?" Oh, how boring. "One of these days, you're going to get fed up with TV, crabgrass, barbecue smoke and that whole dull story." So what do you do? Simple—buy yourself an airplane and get away from it all.

There may be gasoline rationing, of course, but a single copy of RS&T carries ads for several different makes of motor home, any one of which probably costs more than the average British family doctor's take-home pay for a year. On offer is a rich selection of fishing boats, rifles, chalets, cruises, and a "once in a lifetime" automobile produced in a limited edition of 300 vehicles per year for sale or hire to suitably eminent and well-heeled citizens. Also, doctors are invited to invest in a sportsman's paradise.

I particularly like one full-page ad announcing a forthcoming trip to Russia. It describes in detail places and pleasures in the itinerary (such as the Bolshoi) and includes this short but vital sentence: "Throughout your vacation, conferences will be held to keep your medical knowledge up to date and you may deduct the trip from your income tax." Not a word about the identity of the doubtless eminent physicians who would be addressing the eager peripatetic seekers of medical enlightenment, nor yet a hint of what they might be talking *about*. Silly of me to think that this matters.

The net effect of my browse through the heady pages of RS&T was to leave me bemused by visions of a sybaritic way of life which most of us sample only in our dreams. But then a small advertisement, modestly tucked away, caused me to wonder whether American doctors *always* enjoy the carefree existence suggested by the rest of the magazine. It was headed "Borrow up to $10,000 within 24 hours."

Dr. Gould, a British M.D., *writes a medical column for the* GUARDIAN *and has contributed articles to* SMITHSONIAN, *including the one that begins on p. 66.*

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